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Potato varietal evaluation for Western Australia's fresh and export markets

Peter Dawson
Department of Agriculture
Western Australia

Project Number: PT00010

PT00010

This report is published by Horticulture Australia Ltd to pass on information concerning horticultural research and development undertaken for the potato industry.

The research contained in this report was funded by Horticulture Australia Ltd with the financial support of the WA Potato Industry Trust Fund and the Agriculture Produce Commission Potato Producers Committee.

ISBN 0 7341 0790 0

Published and distributed by:
Horticultural Australia Ltd
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50 Carrington Street
Sydney NSW 2000
Telephone: (02) 8295 2300
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E-Mail: horticulture@horticulture.com.au

FINAL REPORT

HORTICULTURAL RESEARCH AND DEVELOPMENT CORPORATION

PROJECT PT00010 (31/10/03)

POTATO VARIETY EVALUATION FOR WESTERN AUSTRALIA'S FRESH AND EXPORT MARKETS

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Purpose of this Report:	To present experimental data and methods that led to identification of new varieties recommended for commercial testing.
Funding Sources:	Department of Agriculture, Western Australia, The Potato Producers Committee of the Agricultural Produce Commission, Horticulture Australia Ltd, potato growers and processors who assisted with these projects.

Government of Western Australia
Department of Agriculture

Horticulture Australia

Agricultural Produce Commission

Date	14 November 2003
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Growers and industry representatives examining and discussing new varieties at one of the 18 demonstrations held as part of this project.

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1. Media Summary

Key components of project

New potato varieties were selected under Western Australia conditions. Varieties with potential benefits to industry and consumers were identified and recommended for commercial testing.

Industry significance

This work is important because improved varieties can improve both production efficiency and consumer satisfaction.

Key outcomes

The new crisp variety, Bliss, offers improved quality and yield and is a good example of the benefits improved varieties can provide. Bliss has 24% higher yield in October/November plantings compared with Atlantic, the standard crisp variety. Bliss also has much higher starch levels than Atlantic. These improvements benefit farmers and processors alike. Bliss is being grown for the export market where its high yield and good quality helps increase the competitiveness of the WA industry.

For French fry production six varieties with improved yield and/or quality, compared with standard main crop variety, were selected. These were Sleeping Beauty, MacRusset, Barman and 94-42-10. Last, My Fry and Windsor may allow low input, out-of-season, production.

Five fresh market selections were made. Suitable for summer crops were Auski and Billabong. Suitable for winter production were Maris Piper and White Star. Windsor, already mentioned as a French-fry variety, could be a multi-purpose fresh variety for winter production.

Conclusions

Improved potato varieties adapted to local conditions were readily obtained through this local selection program.

Recommendations for future R&D

1. Variety evaluation should continue in WA because the varieties selected are different to those being selected in the eastern states.
2. Growers need assistance to develop appropriate agronomy techniques to get the most out of new varieties. More agronomy work should be included in future variety testing projects.

Recommendations for practical application to industry

New varieties need to be proven on a commercial scale. The new procedures proposed by the National Evaluation and Commercialisation Committee for the Fresh Potato Breeding Program (FNECC) provide for this commercialisation phase and so should be supported.

2. Technical Summary

Nature of problem

The standard potato varieties grown in WA have faults that limit production and marketing. Gains can be made if improved varieties are developed and adopted. Our aim was to select improved varieties for the crisp, fresh and French-fry industries. Improvements in quality, yield and disease resistance were sought.

Research undertaken

About 250 breeding lines were obtained annually from the National Potato Improvement Centre (NPIC). These were screened in WA and those suited to local growing and marketing conditions were tested further in district trials and demonstrations. Varieties that offered benefits to industry were recommended for commercial testing.

Major findings & industry outcomes

The new crisp variety, 90-2-6 (Bliss), offers improved quality and yield and is a good example of the benefits improved varieties can provide. 90-2-6 (Bliss) has 24% higher yield in October/November plantings compared with Atlantic, the standard crisp variety. 90-2-6 (Bliss) also has much higher specific gravity than Atlantic. In October/November plantings 90-2-6 had SG of 1.090 cf. Atlantic's 1.077. Fry colour for this time was the same as Atlantic while internal disorders of 3% were less than Atlantic's 16%. 90-2-6 (Bliss) grows well at other times of year, even in winter, and maintains its higher SG throughout the year. 90-2-6 (Bliss) is being grown for the export market where its high yield and good quality helps increase the competitiveness of the WA industry.

For French-fry production six varieties with improved yield and/or quality, compared with standard main crop variety, were selected. These were 89-19-2 (Sleeping Beauty), 89-27-33 (MacRusset), 92-37-1 (Barman) and 94-42-10. Last, 89-27-6 (My Fry)and 96-141-12 (Windsor) may allow low input, out-of-season, production. The WA Chip Company is now testing the four new main-crop varieties on a small commercial scale.

Five fresh market selections were made. Maris Piper and 97-38-2 (White Star) were suited to winter production. Compared with the standard varieties Delaware and Nadine they had improved appearance and pack-out. Maris Piper also had improved resistance to powdery scab as well as resistance to PCN which gives it an advantage over Delaware. 97-38-2 (White Star) had more versatile cooking quality and yield than Nadine as well as larger tubers and better fry quality than Delaware and Nadine. Both these varieties are under going commercial tests in WA. 95-11-20 (Auski) was suited to summer production where, compared with Delaware, it had a 20% higher marketable yield, larger tubers, better appearance, better skin bloom and lighter fry colour. 95-37-12 (Billabong) was selected for summer production too where it had better appearance than Delaware, higher specific gravity and better taste than Nadine with better post harvest skin bloom and fry quality than Delaware and Nadine. 96-141-12 (Windsor) was identified as a potential early French-fry variety with suitable appearance for the fresh market. It had larger tubers than 89-12-1 (Eureka) which is the closest, existing commercial variety.

The new variety Ruby Lou, selected in the last project (Dawson & Mortimore 2000), is now the standard red skinned variety grown on WA.

Viral infection of two breeding lines has interrupted variety evaluation work in WA. This work will continue once all material has been tested and found free of the virus.

Recommendations

1. That the screening of breeder's lines selected in the second field generation at the NPIC continues in WA.
2. That the publication *Potato Cultivar Trials in Australia* should re-commence. Even more useful would be a web based, database for all Australian breeding line evaluations. This would allow earlier and easier access to information on new varieties.

Future work

Consideration should be given to targeting variety evaluation work to specific production problems. This is because the FNECC requires commercialisation as well as variety evaluation. Focusing on a specific problem will enable increased workload to be done without greatly increasing costs.

3. Introduction

Historical Background

This project PT00010 continues work commenced with HRDC Project PT017 *Potato Variety Evaluation for local, export and processing markets* which commenced in 1989 (Dawson *et al*. 1997), Projects PT214, PT515 and PT96017 all entitled *Potato Breeding & cultivar trials in Australia - Western Australia component* (Dawson *et al*. 1998, Dawson & Mortimore 2000). Projects PT214 and PT515 formed part of the National Potato Improvement & Evaluation Scheme (NaPIES) that commenced in 1993. This scheme is based on the potato breeding program of Agriculture Victoria with evaluation of breeding lines being carried out in all states.

Significance to Industry

Potato purchasers' specifications are not always met with the current varieties and so the industry does not operate to its full potential. Examples showing how current varieties do not meet consumer and grower expectations for the crisp, French-fry and fresh market are given below.

The crisp manufacturers require round small potatoes with high specific gravity and light fry colour free of internal faults. The standard variety, Atlantic, is prone to internal disorders and it must be planted at high (expensive) density in order to produce profitable crops of small sized tubers. Most growth in this sector has been in the export market where yield, specific gravity and fry colour is more important than shape. Improved crisp varieties will have smaller tubers, reduced internal faults and they may be able to be processed all year round.

The French-fry production in WA has declined markedly after the closure of the Simplot Manjimup factory in 1999. The remaining small scale processors would benefit from multi-purpose varieties which could be grown for the fresh, French-fry and crisp markets. Such a potato would have to have suitable appearance for the fresh market, oblong shape of large tubers and rounder shape for the smaller tubers. It would have to have acceptable boiling quality and frying quality and suitable specific gravity for processing.

Delaware, the old fresh market standard, produced too many small tubers in winter which were much too susceptible to powdery scab. Delaware tubers also had poor cosmetic quality over summer (Harvey & Considine 1993). Nadine, a selection from earlier projects, solved some of these problems. Nadine's tuber size in winter was better than Delaware and its cosmetic appeal from summer crops was also superior. The identification of the benefits of Nadine led to a radical change. Market share for Nadine increased from <1% in 1992/93 to 70% in 1998/99. For all of previous living memory the variety Delaware had accounted for 90% of WA production. However there is now consumer reaction against Nadine's limited culinary quality. New varieties will have good looks, high yield, more versatile cooking quality and improved flavour.

For all markets potatoes need to be more tolerant of diseases, pests and physiological disorders. Improvement is being sought for: tuber shape, fleck, hollow heart, blight (*Alternaria solani*), potato cyst nematode (*Globodera rostochiensis* Ro1), soft rot (*Erwinia*

sp.), silver scurf (*Helmithosporium solani*), black dot (*Colletotrichum coccodes*) and powdery scab (*Spongospora subterranea*).

Aim

The project was undertaken to provide superior potato varieties better suited to the requirements of the WA potato industries. This report shows that new varieties we have selected offer the industry many benefits that will help to improve their efficiency and sales.

Hints for reading this report

The report discusses the crisp, French-fry and fresh markets separately. After reading the Introduction and Methods, readers may like to go direct to the Discussion section for the market segment of their interest. Here the evaluation results are summarised and the benefits of the selections are discussed. Finer details of the work can then be followed up in the Result sections. The final sections, Technology Transfer, Recommendations and Acknowledgements are recommended to all readers.

The appendix provides a list of abbreviations used.

4. Materials & Methods

4.1 Sources of material

Breeding

New varieties were bred by Department of Primary Industries, Victoria, Agriculture division's Potato Breeding Program based at the National Potato Improvement Centre (NPIC) in Victoria. 25,000 seedlings are produced annually but only 20,000 produce tubers. All 20,000 are field tested and around 1,500 are selected for further evaluation in the second year. These 1,500 lines are grown in short rows and selected on the basis of tuber characteristics, agronomic and cooking tests.

A tripartite number identifies the breeding lines. For example White Star was tested as 97-38-2. The 97 indicates the year the first field generation was planted, the middle number indicates the cross (Gladiator x 91-158-6) while the last number indicates that White Star was the second selection from that cross in the first field generation.

Importation

About twenty new varieties are imported into Australia annually. The imported varieties are also screened at the NPIC.

4.2 Testing sites and planting times

The first test in WA is an unreplicated summer grown screening. Seed from this screening is used to plant a winter grown unreplicated screening. Selections from both unreplicated screenings are then bulked in a replicated summer screening where more selection pressure is applied to previous summer selections. The winter selections are bulked for further testing without additional selection.

The next phase of testing is replicated district trials. These are planted to match the planting times of the major production areas. Selections from these trials then proceed to a demonstraion phase.

The demonstrations phase follows the district trial pattern. Plots are larger but are unreplicated. Farmers and other industry representatives are invited participate in the selection of varieties at the harvest of all demonstrations.

Grown concurrently with the winter grown district trial is a disease screening. This is used to assess field tolerance to powdery scab and a disorder known as crocodile skin. To ensure disease screening findings are accurate the disease screening is repeated for entries selected for demonstrations.

During the testing procedure, which takes four years, seed lines were maintained in two seed bulkings.

These activities are described in more detail below and they are illustrated in the flow chart (Figure 4.1.).

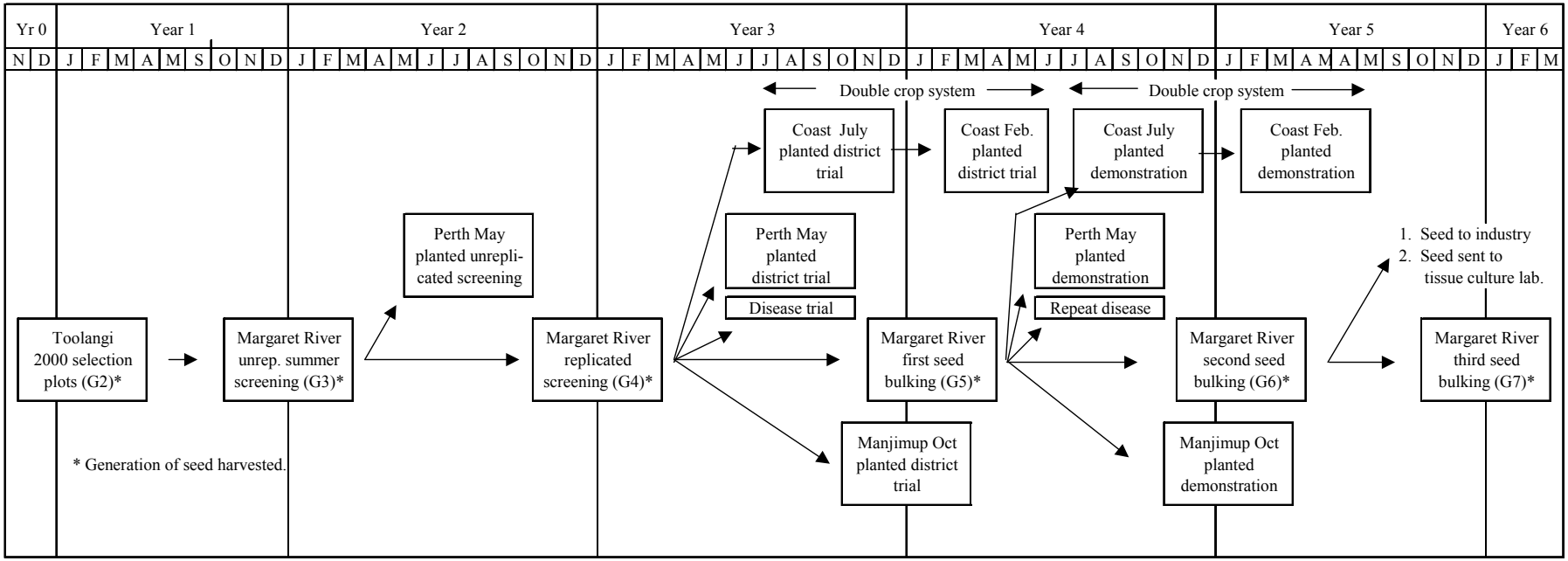

Figure 4.1. Flow chart showing experimental sequence used for the national potato improvement & evaluation scheme Western Australia

Type, design & size of experiments

Unreplicated Screenings

Selection of material for testing in WA begins with the second year material grown at the NPIC. A member of the AGWEST potato evaluation team attends harvest at the NPIC to apply a selection bias suitable for the WA industry. This bias includes selection of oblong varieties for the fresh market, varieties that may be susceptible to late blight which show other promising characteristics (this disease is not important in WA), less smooth skin texture for the fresh market, longer growing French fry varieties and yellow fleshed varieties for the export market.

Three tubers of each of 200-300 selections were supplied by the NPIC. Tubers of standard varieties were also obtained from the NPIC to ensure seed of the standard varieties was of the same generation and physiological age as the breeding lines.

The tubers were brought into WA under a quarantine exemption because no potatoes may be imported in WA from Victoria due to PCN restrictions. The material had to be dipped in bleach (2% available chlorine for 45 minutes) upon arrival.

The first screening was planted in October in the high yielding seed production area of Margaret River. Two tubers were used to plant two-row plots, each with eight plants at 25 cm spacing between setts. A buffer area between plots was planted with a contrasting coloured variety to prevent "end-plant" effects.

Two tubers from the first unreplicated summer screening were used to plant the second unreplicated screening planted in winter in the Perth metropolitan area. This screening allowed selection of varieties which performed well in winter. This winter screening was dug in early October to allow selection of material before the next seed bulking was planted at the end of October.

Replicated screening (also a seed bulking)

Selections from the two unreplicated screenings grown in a replicated screening trial planted at Margaret River late in the following October. All market tyopes were planted in the one trial but results were analysed separately for the major market types. Imported, named varieties commenced testing at this stage if sufficient seed was available. Two replicates were planted. Plots were two rows by 3.6 m having 36 plants on average. 60 cm of row between plots was planted with a buffer variety having tubers of contrasting colour to separate the plots. The use of two row plots is effective and economical as it eliminates "half" the edge effects. A twin row digger was used at harvest. The replicated screenings allowed further summer selection to ensure only the best entries are selected for further testing.

After the replicated screening sufficient seed was available to plant the subsequent district trial program. The seed age of shed stored seed was suitable for the next plantings, May and July planted district trials. For the October district trial and the October seed bulking at Margaret River seed was cool-stored.

District Trials

District trial sites were planted at three locations to cover the major production areas. Planting times were representative for these areas. The trials were planted in commercial crops. Two row plots, as described in replicated screening above, were used with three replicates being planted. About 30 entries were usually tested each year for district trials. As for the replicated screening, all market tyopes were planted in the one trial but results were analysed separately for the major market types. The district trial sites were as follows:

Fresh market trials

1. Perth metropolitan winter production site planted in May.
2. Coast (Myalup/Binningup/Jindong). Spring production site, planted from June to July. This was the first of a pair of trials to test for entries suited to the double cropping system used on the Swan Coastal Plain. In this system two crops are grown with the first crop being planted from June to July with fresh seed from seed growing areas. When this crop is harvested in November/December round seed is saved by growers for the second January/February planting. However we used cut seed to plant the January/February planted trial to identify varieties that resist breakdown of cut seed.
3. Coast (Myalup/Binningup/Jindong). Autumn production site, planted in mid February. This was the second of a pair of trials to test for entries suited to the double cropping system used on the Swan Coastal Plain.
4. Manjimup/Pemberton. Summer production site in the major production area planted October to November.

Demonstrations

Varieties selected from the district trial program were next tested in a demonstration phase. Demonstrations allow:

- district trial results to be confirmed, and
- growers and industry representatives to participate in the evaluation of the varieties.

The demonstrations were planted in commercial crops during the most important time of planting for each industry. Unreplicated double row plots 15 metres long were planted. The scheduling of these demonstrations closely followed the trial program. Mostly six to 12 varieties were grown at each site.

We tried to name all varieties before they were tested in demonstrations. This was done to allow easier identification and as an aid to memory. We have found that the breeding line serial numbers were confusing and difficult to memorise. On-farm testing is the best way to get adoption of new varieties. Varieties selected from the demonstrations were then released to farmers for commercial trial.

A field day was held when each demonstration was harvested. In the last two years of the project, farmers and industry representatives were asked, at the start of the field day, to inspect the unlabelled, harvested plots which were laid out on the ground. They were then asked to vote for their top three varieties using a simple 1, 2, 3 vote. All votes were used to determine the industry's favourites. First, or "1" votes were multiplied by 3. Second, or "2" votes were ultiplied by 2 while thrid votes were simply added to give a final ranking of votes. Subsequent discussions then concentrated on these most popular varieties.

Fresh market demonstrations

1. Perth metropolitan winter production site planted April to May.
2. Coast (Myalup/Binningup/Jindong). Spring production site, planted from June to July. This was the first of a pair of demonstrations to test for entries suited to the double cropping system used on the Swan Coastal Plain
3. Coast (Myalup/Binningup/Jindong). Autumn production site, planted in mid February. Seed used was from the previous spring production site. Plots were 20 m long, half was planted with cut seed and half with round seed. This was done to identify entries that performed well from cut seed as these would be of benefit to industry.
4. Manjimup/Pemberton. Summer production site in the major production area planted October to November.
5.

French-fry demonstration

1. Manjimup/Pemberton. Main crop production site in the major processing area planted October to November.
2.

Crisp demonstrations

Crisp evaluation recommenced in the twelfth series due to renewed interest in the export market. Crisp testing had previously stopped after the seventh series.

1. Swan Coastal Plain. Spring production site, planted from June to July. This was the first of a pair of demonstrations to test for entries suited to the double cropping system used on the Swan Coastal Plain.
2. Swan Coastal Plain. Autumn production site, planted January to March. Seed used was from the previous spring production site. Plots were 20 m long; half was planted with cut seed and half with round seed. This was done to identify entries that performed well from cut seed as these would be of benefit to industry.
3. Manjimup/Pemberton. Main crop production site in the major processing area planted October to November.

Seed bulkings

The first two October planted screenings were also used to bulk high quality seed. This seed must also be maintained while the district trial program is in progress. At this stage many selections were held only in Western Australia. Two additional seed bulkings were therefore planted in October in years three and four at Margaret River. These seed bulkings ensured high quality seed of selections from district trials and demonstrations was available for release to seed growers so that further on-farm testing could commence. The seed bulkings also meant that tubers of selections could be sent to the NPIC for pathogen testing and mini-tuber production.

4.3 Measurements

Growth characteristics

Dates when 50% of plants emerged, closed, matured and broke dormancy were recorded. Dormancy was assessed by noting when 2 out of 3 tubers, stoted under sacks in a shed, had shoots 3 mm long.

Tuber characteristics

At harvest a tick sheet of tuber characters was completed. Skin colour and texture, eye and heel depth, shape and size and uniformity of same, plus faults and disease reaction were recorded. Also entries were classified according to market type during the harvest inspection of all screenings. Round tubers with uniform small size were classified as crisp, oblong large tubers were classified as French-fries while both round and oblong varieties with smooth skin and shallow eyes were classified as fresh market. Once the entries were classified into market types their tuber characteristics were recorded as being suitable, questionable or unsuitable. The suitability for the market is shown in the results tables by the typeface. Bold typeface indicates suitable tuber characteristics, plain typeface indicates questionable tuber characteristics while italic typeface indicates unsuitable tuber characteristics.

Wash pack quality

A sample of 25 tubers was harvested by hand 2 weeks after maturity of that variety, hand washed and packed in plastic bags for two weeks in the dark at room temperature. The tubers were assessed weekly for; skin bloom, percentage of marketable tubers, amount of rots and amount of shooting. This allowed selection of varieties that tolerate washing and storage and maintain their appearance in the market chain.

Coloured skin variety selection

The major fault with coloured entries is their susceptibility to skin loss during harvesting and washing. Therefore coloured entries were screened for their susceptibility to skinning. Coloured selections were grown in a small plot during the replicated screening phase of testing in order to provide a washing sample and a seed sample. The washing sample was tested at a commercial washing plant and the percentage of skin removed was assessed. Standard coloured varieties were also assessed for comparison. Only those entries with the least amount of skinning proceeded to district trials.

Disease resistance

A dedicated powdery scab trial was introduced during the seventh series of fresh market trials using the method of Genet and Braam (1995). Five replicates of four plant plots were used. From each plot tubers >30g were washed and the surface area affected on each tuber was assessed using the following scale;

a) nil,
b) slight (up to 5%),
c) medium (5-25%)
d) severe >25%.

The severity score was calculated from the equation;

$$\text{Severity} = \frac{(b \times 1)+(c \times 2)+(d \times 3)}{a+b+c+d}$$

Entries were tested in two consecutive years in order to improve confidence in the results.

Grading for yield

The grades used varied with market and are shown in Table 4.1.

Table 4.1. Grades yield assessment by market type.

Grade	Market type		
	fresh market	crisp	French fry
chats	0- 70g	0-50g	0-100g
small	70-120g	50-80g	100-280g
medium	120-350g	80-300g	
large	350-450g	300-430g	280-450g
oversize	>450g	>430g	>450g
marketable*	70-450g	50-430g	>100g

*Marketable yield was classed as the small to large grade and this was called
Grade No. 1 for the fresh market trials.

Internal disorders

For the unreplicated winter screening, the replicated screening and district trials 10 tubers from each plot were assessed for internal disorders. Tubers were cut in half and number affected by fleck, hollow heart, vascular stain or other disorders wre recorded. For demonstrations 50 tubers were assessed.

Specific gravity

A 5 kg sample was used to determine specific gravity using the weight in water weight in air method.

Cooking

Fry colour

Crisp

This test showed which varieties produce acceptable frying colour for both the crisp, French fry and fresh markets. Five tubers from each plot are tested. Three unpeeled tubers are cut in half longitudinally and two transversely. One half of each tuber was discarded. Slices about 2.2 mm thick were prepared. The first slice from the remaining halves was also discarded, and the next four slices were cooked to give 20 crisps per sample. The crisps are fried straight away (less than 2 minutes exposure to air) in cottonseed oil at 180°C until bubbling ceased. Crisps were placed in the oil individually to prevent then sticking together. The crisps were then drained and scored for colour using a scale of 1 - 10 shown in Table 4.2. Oil was changed after 90 frying tests.

French fries

Frozen product

This test is based on the methods used by Simplot Australia quality testing laboratory at Manjimup. The test has been devised to give a reliable indication of the how the French fries will appear after going through the factory and being cooked by the end user. The method of tallying the final score is not used by Simplot Australia but is used by AGWEST to allow a concise comparison with the standard varieties.

One 13 mm section French fry was cut from the centre of ten tubers. These ten French fries were blanched in a 1% solution of sodium acid pyrophosphate (SAPP) at 70 - 75°C for 8 minutes. This blanching process mimics the two blanching procedures used by Simplot Australia at Manjimup and is necessary to develop the sugar problems that are not detected with a straight deep fry test. The SAPP solution deteriorates and must be replaced after every 20 samples to ensure the 1% level is maintained. After blanching the French fries were placed on a white tray and immediately scored for **greying** using scale of 0 – 4 where 0 = no greying and 4 = severe greying (see Figure 4.2). A score of >2 is unacceptable. Final score was the sum of the products of the scores and the number of French fries affected. For example 10 French fries with individual scores of 0 will have a final score of 0 but 10 French fries with individual scores comprising 6 threes and 4 twos will have a final score of 26. A final score >20 is considered unacceptable. However varieties which are significantly worse than the standard variety were rejected.

After completing the greying assessment the French fries were deep fried at 190°C for 3'45". They were then scored for sugars and colour.

Sugar was scored by assessing the browning at the stem end of the French fry. Assessment is similar to greying, a scale of 0 - 4 is used with 0 being no sugar and 4 being dark, extensive sugar (see Figure 4.2). An individual score of >2 was unacceptable. Final score was the sum of the products etc., and a final score of 18 was unacceptable. However varieties which are significantly worse than the standard variety were rejected.

Overall **colour** of each French fry is scored on a scale of 1-7 with 1 being white and 7 being dark gold. A score of four or less is acceptable. {This scale equates to Simplot's 000,00,0,1,2,3,4 colour chart, 000 and 00 scores are acceptable in the plant after one minute frying while scores of 0 and 1 are acceptable after full frying in the plant and at home (i.e. about 3'45" frying time in all)}.

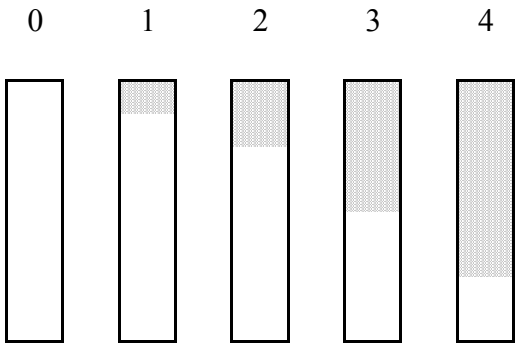

Figure 4.2 Score chart for French fry greying and sugar end. Diagram shows acceptable greying for French fries. Scores of 1-2 are acceptable although score 2 would only make low grade French fries. The same score is used for stem end darkening due to sugars.

Domestic French fries

Fresh French fries for domestic use were made for assessment by Western Potatoes at the demonstration stage. French fries were prepared from three tubers and fried at 170°C for 5 minutes, cooled then re-fried at 190°C for 3 minutes. The fries were scored for overall colour using the frozen French fry method.

Boiling tests

3 tubers from each plot are boiled until soft when tested with a skewer. The tubers are scored for colour, after cooking darkening (ACD), sloughing and mash quality. Mash quality was assessed for one of the boiled tubers. This tuber was mashed to a creamy texture and the riciness, or lumpiness, of this mash was assessed by rubbing mash between thumb and forefinger. These tests are done immediately after cooking except for ACD which was assessed 24 hours after boiling. Details of scoring scales are shown in Table 4.3.

Demonstration tests

In demonstrations a sample of each entry was given to the processors for assessment. This assessment is shown in the Result sections. For the fresh market, Western Potatoes assessed the samples which were cooked at the Department fo Agriculture, WA potato laboratory at Bunbury.

Bruise tests

Bruise tests were done for French fry demonstrations. Five tubers per entry were sampled. Bruises were made by placing the bruise site firmly against a 60 cm long tube down which was dropped a 130 gram ball bearing. Four bruises were made on each tuber, two at the crown end and two at the stem end, to give 20 bruises per entry. The sites were marked with liquid paper. After bruising the tubers were stored for 24 hours. The bruise sites were peeled until the worst part of the bruise appeared. The bruise was scored according to size. Score 0 was for no bruise, score 1 was for 2 mm diameter bruise, score 3 was for 3 mm bruise, score 4 was for 5 mm bruise, score 5 was for a 7 mm bruise, score 6 was for a 10 mm bruise, score 7 was for a 13 mm bruise, score 8 was for a 17 mm bruise and score 9 was for a 20 mm diameter bruise. The score given for each entry was the average of the 20 individual scores.

4.4 Selection criteria

We wanted to identify varieties that would provide benefits to growers and consumers.

For the crisp market we wanted improvements in yield and quality over Atlantic. Main quality factors were shape, specific gravity, fry colour and internal disorders.

Before the thirteenth series of experiments we wanted to identify French-fry specific varieties that offered improvements of Russet Burnak and Shepody. When large scale French-fry processing ceasing in Manjimup in 1999 we decided to evaluate only those French-fry varieties that could also be used for the fresh market. This meant varieties required both cooking quality and appearance acceptable for both fresh market and French-fry processors.

For the fresh market we specifically wanted to identify:

- higher yielding varieties for winter production that had tolerance to powdery scab,
- a replacement for Delaware for summer cropping which had to have improved appearance but similar culinary quality and yield competive with Nadine, and

- a variety suited to the double cropping system that could produce high yields in autumn crops.

Selections criteria used is discussed under the results of each experiment.

Table 4.2. Fry colour score sheet used in cooking tests.

Fry colour tests					
Crisp			French fry		
Range	Score	Description	Range	Score*	Description
Too light	1	White	↑ | Acceptable after 1 minute (') frying for frozen product	1 (000)	White
↑ | | | Desired colour | | | ↓	2	Very light yellow		2 (00)	Very light yellow
	3	Light yellow	↑ Acceptable after 3'45" frying for frozen product ↓	3 (0)	Light yellow
	4	Yellow		4 (1)	Yellow
	5	Light gold	Acceptable after 5' + 3' frying for fresh product	5 (2)	Light gold
Borderline for crisps	6	Gold	↑ | too dark | ↓	6 (3)	Gold
Borderline for French fries	7	Dark gold		7 (4)	Dark gold
↑ | Too dark | ↓	8	Brown	* Simplot score shown in brackets		
	9	Dark brown			
	10	Black			

Table 4.3. Boiling tests, scores and descriptions.

Test	Score	Descriptive terms
Flesh colour	1	White
	2	Creamy white
	3	Cream
	4	Deep cream
	5	Yellow
Greying and after cooking darkening	1	Nil
	2	Slightly grey
	3	Moderate, greyish black
	4	Marked blackening around eyes and/or stem end
	5	General blackening
Disintegration and sloughing	1	Nil, surface smooth and translucent
	2	Slight, surface dull but mainly intact
	3	Moderate, major part of surface sloughed off but mainly intact
	4	Severe, floury mass
	5	Severe, soupy
Riciness after mashing	1	Nil
	2	Slight
	3	Moderate
	4	Marked

4.5 Statistical analysis

Data from replicated experiments are analysed using analysis of variance. Genstat® statistical software is used and residuals are graphed to determine the validity of the analysis. Where significant effects occurred, means were separated from those of the standard variety using least significant difference method.

An “arcsin” transformation of disease data was used when distribution of raw disease index was skew. For example see Table 9.4.12.1

Transformation formula = (asin (sqrt(disease index/100)))*180/pi.

5. Crisp Results

5.1 Background

The Western Australian potato industry produces crisp potatoes for domestic and export processors. The domestic processing industry is dominated by The Smith's Snackfood Company which has an annual capacity of about 15,000 tonnes. The export product is for processors in Malaysia and Indonesia. These processors cannot obtain enough raw material from their local potato industry and import up to 10,000 tonnes from WA annually.

Our target is the export crisp market. To maintain and expand this market WA growers need high yielding potatoes that have excellent crisp quality. It is an advantage if new varieties can be grown successfully out-of-season as this is a period of high demand.

The potato variety evaluation program in WA has already released one crisp variety for the export market. This was Dawmor (89-55-6) which has the potential to produce greater yields of better sized tubers with less internal defects than Atlantic (Dawson & Mortimore 2002a). What is required now is a variety which can be grown over a wider planting period and which has higher specific gravity.

5.2 Eleventh or "95 & earlier" series of crisp variety experiments

5.2.1 Background

Breeding lines of the "95" and earlier series from the Department of Primary Industries, Victoria, Agriculture division's Potato Breeding Program were tested in three demonstrations. The previous district trials and screenings of this series of experiments were completed during a previous project (Dawson and Mortimore 2000).

5.2.2. Experiment 00MA8 - October 2000 planted demonstration at Pemberton.

Aim

To demonstrate and select, under commercial conditions, entries suited for crisp production in an October planting. Selections must produce high yield with good processing quality. The current standard is Atlantic.

Results

Yield and quality data are shown in Table 5.2.2. All entries had suitable tuber characteristics, specific gravity and fry colour. Crispa, 89-55-6 (Dawmor) and 95-11-25 (Minilya) had high yields of small potatoes (50-80g/45-50 mm). High levels of internal disorders were found in 91-106-1 (Sonic) (fleck) and 91-1-5 (Wilson) (hollow heart). Selections for further testing were Crispa, 89-55-6 (Dawmor), 90-2-6 (Bliss) and 95-11-25 (Minilya). 93-6-3 (Kirkie) was not selected as its yield was too low.

95-11-25 (Minilya) had suitable tuber characteristics for the fresh market and should be tested in fresh market demonstrations.

5.2.3. Experiments 01HA3 A & B - July 2001 & March 2002 planted demonstrations at Myalup.

Aim

To demonstrate and select, under commercial conditions, entries suited to spring and autumn production of the double cropping system of the Swan Coastal Plain.

Results

July planting

Yield and quality data are shown in Table 5.2.3.1. The current standard is Atlantic. Selections need to have suitable tuber characteristics, light fry colour, specific gravity similar to Atlantic, high yields and no major faults. Tuber characteristics were suitable for Atlantic, 90-2-6 (Bliss), 91-1-5 (Wilson), 91-106-1 (Sonic) and 93-6-3 (Kirkie). However 90-2-6 (Bliss), 91-1-5 (Wilson), 91-106-1 (Sonic) all fried darker than Atlantic. 93-6-3 (Kirkie) has low specific gravity. No entries performed better than Atlantic.

March planting

Cut and round seed were tested: varieties that emerge well from cut seed under the hot planting conditions are preferred. Yield and quality data are shown in Table 5.2.3.2. Some plots grew erratically with uneven germination due to suspected non-wetting problems. Also the trial site was variable with some plots severely affected by a shallow limestone ridge. Selections had suitable tuber characteristics, light fry colour, specific gravity similar to Atlantic, high yields and no major faults. Tuber characteristics were suitable for Atlantic, 90-2-6 (Bliss), Crispa and 91-1-5 (Wilson). However Crispa and 91-1-5 (Wilson) had low yield. 90-2-6 (Bliss) performed better than Atlantic with similar yields and frying colour but higher specific gravity.

Overall selections

To be commercially acceptable for the double cropping system of the Swan Coastal Plain it is an advantage for selections to perform well at both planting times. No entries were selected at both times. However 90-2-6 (Bliss) performed better than Atlantic in the March planting although in the July planting it had borderline fry colour.

5.2.4 Selections from the eleventh series of crisp experiments

90-2-6 (Bliss) was the sole crisp selection from this series of experiments. This breeding line was also selected in the previous project (Dawson & Mortimore 2000) where it was identified as offering benefits over Atlantic in both the double-crop (July planting followed by a January/February planting using "kept" seed) and October/November plantings. A summary of 90-2-6's (Bliss') performance can be found in the Crisp Discussion (Section 6.2).

95-11-25 (Minilya) was identified as a possible fresh market variety and testing for this market was recommended. It was subsequently tested in demonstrations of the twelfth series of fresh market experiments (See Sections 9.3.7 & 9.3.8) but was not selected from these demonstrations.

Table 5.2.2. Yield and quality of crisp entries in an October 2000 planted demonstration at Pemberton.

Planted: 25 October 2000 Harvested: 14 March 2001 Soil temperature at harvest: 16°C
Row spacing: 75 cm Soil type: clay loam Elevation: 120 m

Entry, tuber characteristics* & spacing in row		Yield (t/ha)						Rank by Grade No 1	Tuber no per plant	Quality		
		Chats	Small	Med-ium	Large	Crisp Grade	Over size			SG	Fry colour	Flesh faults (%)†
		0-50g	50-80g	80-300g	300-430g	50-430g	>430g					
	cm	<45mm	45-5 mm	50-85 mm	85-95 mm	45-95 mm	>95 mm					
Atlantic	15	1.9	4.3	46.3	0.1	50.8	0.0	4	5.6	1.084	6	10
Crispa	30	6.5	11.6	36.4	0.0	48.0	0.0	5	20.5	1.093	6	18
Dawmor	20	4.3	9.9	45.3	0.1	55.3	0.0	1	11.6	1.084	2	6
90-2-6 (Bliss)	20	1.7	4.7	43.3	0.0	48.0	0.0	6	7.6	1.101	3	4
91-106-1 (Sonic)	20	2.4	3.7	45.7	1.4	50.8	0.0	3	7.7	1.086	3	26†
91-1-5 (Wilson)	25	2.2	5.1	40.9	0.3	46.3	0.0	7	9.4	1.083	5	68†
93-6-3 (Kirkie)	30	3.6	7.0	29.5	0.2	36.7	0.0	8	12.1	1.085	5	10
95-11-25 (Minilya)	25	3.7	9.2	43.2	0.0	52.4	0.0	2	13.5	1.084	3	0†

* Tuber characteristics: **bold** face = suitable, plain = questionable, *italic* = unsuitable.
# Samples assessed visually after crisping: 1 - 10, 6 = borderline, >6 = too dark for crisps.
†Flesh faults; † indicates significantly different internal disorders from Atlantic.

Table 5.2.3.1. Yield and quality of crisp entries in a July 2001 planted demonstration at Myalup.

Planted: 3 July 2001 Harvested: 20 November 2001 Soil temperature at harvest: 16°C
Row spacing: 75 cm Soil type: alkaline sand Elevation: 10 m

Entry & tuber* characteristics	Spacing in rows (cm)	Yield (t/ha)						Rank by Grade No 1	Tuber no per plant	Quality		
		Chats	Small	Medium	Large	Grade No 1	Over size			SG	Fry# colour	Flesh† faults (%)
		0-50g	50-80g	80-300g	300-430g	50-430g	>430g					
Atlantic	20	0.5	5.2	46.8	0.0	52.0	0.0	1	7.6	1.094	3	10
Atlantic (grower's seed)	20	0.5	3.0	47.2	0.0	50.3	0.0	3	6.3	1.094	2	14
Crispa	30	2.9	11.3	22.7	0.0	33.9	0.0	9	12.4	1.094	4	0†
Dawmor	20	3.4	12.6	35.4	0.0	47.9	0.0	4	10.7	1.081	4	0†
90-2-6 (Bliss)	20	0.6	3.9	43.1	0.4	47.5	0.0	5	5.8	1.098	6	0†
91-1-5 (Wilson)	25	1.2	9.8	37.0	0.0	46.7	0.0	6	10.4	1.088	5	0†
91-106-1 (Sonic)	20	1.1	6.6	43.7	0.4	50.7	0.0	2	8.5	1.089	5	0†
93-6-3 (Kirkie)	30	0.6	3.0	40.8	0.3	44.1	0.0	7	8.5	1.080	3	0†
95-11-25 (Minilya)	25	1.7	7.8	32.2	0.0	40.0	0.0	8	9.9	1.083	4	54†

* Tuber characteristics: **bold** face = suitable, plain = questionable, *italic* = unsuitable.
# Samples assessed visually after crisping: 1 - 10, 6 = borderline, >6 = too dark for crisps.
†Flesh faults; † indicates significantly different internal disorders from Atlantic.

Table 5.2.3.2. Yield and quality of crisp entries in a March 2002 planted demonstration at Myalup.

Planted: 7 March 2002 | Harvested: 18 July 2002 | Soil temperature at harvest: 13°C
Row spacing: 75 cm | Soil type: alkaline sand | Elevation: 10 m

Entry & tuber* characteristics	Spacing in rows (cm)	Yield (t/ha)						Rank by	Cut seed yield		Tuber no per plant	Quality		
		Chats	Grade No 1	Medium	Large	Grade No 1	Over size	Grade No 1	Grade No 1	(% of round)		SG	Fry# colour	Flesh† faults (%)
		0-50g	50-80g	80-300g	300-430g	50-430g	>430g	50-430g	50-430g					
Atlantic	20	2.0	2.6	30.1	0.4	33.1	0.0	5	22.3	67	5.1	1.081	4	4
Atlantic (grower's seed)	20	1.1	1.7	36.4	1.2	39.3	0.0	2	-	-	5.5	-	-	8
Crispa	30	2.6	3.1	19.8	0.0	22.9	0.0	9	17.4	76	9.0	1.084	3	0
Dawmor	20	7.3	11.3	30.7	0.3	42.3	0.0	1	39.0	92	12.7	1.073	5	0
90-2-6 (Bliss)	20	1.1	1.5	34.2	0.6	36.3	0.0	3	29.0	80	5.5	1.087	5	0
91-106-1 (Sonic)	20	1.4	1.3	31.2	1.8	34.3	1.0	4	23.7	69	5.3	1.080	3	0
91-1-5 (Wilson)	25	4.5	4.0	22.4	0.0	26.4	0.0	8	23.1	88	7.3	1.080	4	0
93-6-3 (Kirkie)	30	0.7	1.5	26.2	0.3	28.0	0.0	7	30.2	108	5.7	1.075	5	6
95-11-25 (Minilya)	25	0.6	2.8	26.8	0.3	29.9	0.0	6	25.9	87	5.2	1.076	4	10

* Tuber characteristics: **bold** face = suitable, plain = questionable, *italic* = unsuitable.
# Samples assessed visually after crisping: 1 - 10, 6 = borderline, >6 = too dark for crisps.
†Flesh faults; † indicates significantly different internal disorders from Atlantic.

5.3 Twelfth or "96" series of crisp experiments

5.3.1 Background

Breeding lines of the "96" series from Department of Primary Industries, Victoria, Agriculture division's Potato Breeding Program were tested. Four district trials were completed and results are described below. Three previously completed screenings were reported by Dawson & Mortimore (2000). The demonstration test phase was postponed until the next series (see Section 5.4) as no new selections were made.

5.3.2. Experiment 00PE2 – May planted district trial.

Aim

To select entries suited to crisp production from a May planting. Varieties that are suited to producing high yields with good processing quality under cold conditions are required.

Results

Yield and quality data are shown in Table 5.3.2. Varieties which perform better than Atlantic are required. This meant selections needed to have suitable tuber characteristics, yield greater than 34.2 t/ha, specific gravity greater than 1.087, fry colour less than 4.9 and flesh faults less than 17%.

Table 5.3.2. Yield and quality of crisp entries in a May 2000 planted district trial at Baldivis.

Planted: 19 May 2000 Harvested: 19 October 2000 Soil type: alkaline sand
Row spacing: 68 cm Soil temp. at harvest: 16°C Elevation: 20 m

Entry, tuber* characteristics & spacing in row (cm)		Yield (t/ha) Chats 0-70g	Small 70-120g	Med-ium 120-350g	Large 350-450g	Grade No. 1 70-450g	Over size >450g	Rank by Grade No.1	Tuber no. per plant	Quality SG	Fry# color	Flesh† faults (%)	Pwd~ scab tol
Selection criteria													
Suitable						>34.2				>1.087	<4.9	<17	tol
Atlantic	15	4.1	12.9	26.5	0.0	39.4	0.0	2	4.7	1.092	3.3	0	-
Crispa	30	5.2	15.1	11.1	0.0	26.2	0.0	9	8.3	1.089	5.0	0	tol
90-2-6	20	1.7	7.4	31.5	1.3	40.2	0.0	1	4.3	1.097	4.3	0	tol
91-1-5	24	4.0	7.9	19.9	0.0	27.8	0.0	7	6.4	1.087	4.3	3	h sus
91-106-1	20	2.5	7.0	29.0	0.3	36.3	0.0	3	4.9	1.089	3.7	33+	h sus
93-6-3	30	1.3	5.7	22.7	0.0	28.4	0.0	6	5.4	1.085	5.3	0	tol
95-11-25	24	2.5	10.9	25.0	0.0	35.8	0.0	4	6.1	1.084	6.0	17+	h sus
96-28-1	30	3.2	9.7	9.2	0.0	18.9	0.0	10	5.7	1.075	7.0	0	tol
96-28-5	30	3.3	8.7	19.0	0.0	27.7	0.0	8	6.3	1.094	7.0	7	h sus
96-29-7	24	4.2	10.8	21.8	0.0	32.5	0.0	5	6.5	1.070	5.7	37+	sus
Significance+		*	*	***	skew	***	ns		***	***	***		
LSD P = 0.05		2.1	4.7	5.9		5.2			1.2	0.005	1.6		

* Tuber characteristics: **bold** typeface = suitable, plain type = questionable, *italic* = unsuitable.
# Samples assessed visually after crisping: 1 - 10, 6 = borderline, >6 = too dark for crisps.
† Indicates significantly different flesh faults (internal disorders) from Atlantic.
~ from experiment 00PE4, see section 9.3.9.
+ "skew" indicates data did not fulfil assumptions of analysis of variance.

Tolerance to powdery scab is also desirable. Entries which are highly susceptible to powdery scab should not be selected. No entries met these criteria. 90-2-6 (Bliss) came closest to selection but its shape was oblong.

5.3.3. Experiments 00HA1A & B - July 2000 & February 2001 planted district trials at Myalup.

Aim

To select crisp entries suited for production in the double cropping system used on the Swan coastal plain. Entries were tested in a pair of trials; the first was planted in July. When this trial was harvested in December cutting seed was saved for the second trial of the pair which was planted in January. The aim is to select entries that are suited to both times of planting.

Results

July selections

Yield and quality data are shown in Table 5.3.3.1. Selections required suitable tuber characteristics with specific gravity above 1.090 (not significantly less than Atlantic) with yield greater than 37.6 t/ha (not significantly less than Atlantic), with fry colour not significantly darker than Atlantic with no major faults. The sole selection was 90-2-6 (Bliss).

Table 5.3.3.1. Yield and quality of crisp entries in a July 2000 planted district trial at Myalup.

Planted: 18 July 2000		Harvested: 18 December 2001							Soil type: alkaline sand				
Row spacing: 70 cm		Soil temp. at harvest: 24°C							Elevation: 10 m				
Entry & tuber* characteristics	Spacing in rows (cm)	Yield (t/ha)						Rank by Grade No.1	Tuber by per plant	Quality			
		Chats 0-70g	Small 70-120g	Medium 120-350g	Large 350-450g	Grade No. 1 70-450g	Oversize >450g			SG	Fry# color	ACD @	Flesh faults (%)†
Selection criteria						>37.6				>1.090			<17
Atlantic	15	5.0	8.3	43.0	0.0	51.3	0.0	4	5.6	1.094	4.7	1.8	0
Crispa	30	8.8	23.2	25.0	0.5	48.7	0.0	5	13.2	1.090	3.7	2.0	3
90-2-6	20	4.4	11.9	58.1	5.5	75.5	0.0	1	7.6	1.092	4.7	1.0	0
91-1-5	24	7.7	15.4	24.4	0.0	39.8	0.0	6	8.8	1.089	4.0	1.7	3
91-106-1	20	5.8	15.4	46.4	0.0	61.8	0.0	3	7.9	1.087	3.7	1.8	70†
93-6-3	30	3.1	13.4	51.8	0.8	66.1	0.0	2	10.4	1.079	5.3	1.7	17†
96-28-1	30	4.5	11.3	20.6	0.0	31.9	0.0	7	8.0	1.077	5.7	1.2	0
Significance+		**	*	**	skew	***			***	***	ns	**	
LSD P = 0.05		2.5	7.2	18.0		13.7			1.9	0.004		0.5	

* Tuber characteristics: **bold** typeface = suitable, plain type = questionable, *italic* = unsuitable.
# Samples assessed visually after crisping: 1 - 10, 6 = borderline, >6 = too dark for crisps.
@ ACD (after cooking darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
† Indicates significantly different flesh faults (internal disorders) from Atlantic.
+ "skew" indicates data did not fulfil assumptions of analysis of variance.

February selections

Yield and quality data are shown in Table 5.3.3.2. The trial grew well but was short of moisture at maturity. Selections had to have improvements over Atlantic. Yield, light fry colour and high specific gravity are especially important. 90-2-6 (Bliss) was the only entry with better performance than Atlantic. It had similar tuber characteristics, similar yield, similar fry colour, similar specific gravity but significantly lower internal disorders. After cooking darkening was also significantly less than Atlantic.

Overall selections

This trial is one of a pair that tests suitability for the double cropping system. Selections must do well at both planting times. The only selection made at each planting time was 90-2-6 (Bliss).

Table 5.3.3.2. Yield and quality of crisp market entries in a February 2001 planted district trial at Myalup.

Planted: 9 February 2001		Harvested: 9 July 2001						Soil type: alkaline sand					
Row spacing: 70 cm		Soil temp. at harvest: 13°C						Elevation: 10 m					
Entry & tuber* characteristics	Spac-ing in rows (cm)	Yield (t/ha)						Rank by Grade No.1	Tuber by per plant	Quality			
		Chats 0-70g	Small 70-120g	Med-ium 120-350g	Large 350-450g	Grade No. 1 70-450g	Over size >450g			SG	Fry# color	ACD @	Flesh faults (%)†
Selection criteria						>42.6				>1.066			<11
Atlantic	15	3.2	8.9	42.6	0.0	51.5	0.0	3	5.2	1.071	4.0	1.5	33
Crispa	30	6.7	13.2	27.1	0.0	40.3	0.0	7	11.7	1.074	2.7	1.3	0†
90-2-6	20	1.9	5.0	45.1	8.8	58.9	1.3	1	5.4	1.079	4.3	1.0	10†
91-1-5	24	5.0	9.7	28.7	0.0	38.4	0.0	8	7.3	1.072	3.7	1.2	0†
91-106-1	20	2.8	11.3	38.0	0.0	49.2	0.4	4	6.8	1.076	3.0	1.2	17
93-6-3	30	2.7	6.2	39.1	2.7	48.0	0.3	5	8.6	1.062	4.7	1.5	50
95-11-25	24	3.0	6.5	45.3	3.3	55.1	1.7	2	7.7	1.067	5.3	2.2	57
96-28-5	30	5.8	15.7	24.8	0.0	40.5	0.0	6	12.5	1.077	6.0	1.3	0†
96-102-1	30	0.9	1.8	28.9	5.6	36.3	1.6	9	5.5	1.060	4.7	1.2	63
Significance+		***	***	**	skew	***	skew		***	***	ns	skew	
LSD P = 0.05		1.5	3.7	10.7		8.9			1.6	0.005			

* Tuber characteristics: **bold** typeface = suitable, plain type = questionable, *italic* = unsuitable.
# Samples assessed visually after crisping: 1 - 10, 6 = borderline, >6 = too dark for crisps.
@ ACD (after cooking darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
† Indicates significantly different flesh faults (internal disorders) from Atlantic.
+ "skew" indicates data did not fulfil assumptions of analysis of variance.

5.3.4. Experiment 00MA1 - October 2000 planted district trial at Manjimup.

Aim

To select entries suited to the export crisp market production in an October planting. High yielding varieties are required.

Results

The trial grew well with high rates of emergence except for Atlantic and 91-1-5 which both had only 54% of plants emerge. Mondial had 71% emergence, 90-26 had 88% while all other

entries had greater than 94% emergence. Yield and quality data are shown in Table 5.3.4. Selections required suitable tuber characteristics with specific gravity above 1.073 (not significantly less than Atlantic) with yield greater than 47.9 t/ha (significantly greater than Atlantic), with fry colour less than 4.9 (not significantly darker than Atlantic) with no major faults. Cadmium levels should not be significantly higher than Atlantic. Selections were 90-2-6 and 91-106-1. This is the second cadmium test completed for 90-2-6 (Bliss). The first test showed significantly higher cadmium levels that Atlantic although the levels were below the MPC (Dawson & Mortimore 2000). This latest test showed that 90-2-6 (Bliss) had less cadmium than Atlantic, 0.035 mg/kg fresh weight cf. Atlantic's 0.044 mg/kg fresh weight, though the difference was not significant.

Table 5.3.4. Yield and quality of crisp entries in an October 2000 planted district trial at Manjimup.

Planted:	27 October 2000				Harvested:	12 March 2001					Soil type:	sandy loam		
Row spacing:	80 cm				Soil temp. at harvest:	16°C					Elevation:	200 m		
Entry & tuber* characteristics	Spac-ing in rows (cm)	Yield (t/ha)						Rank by	Tuber No.	Quality				
		Chats 0-70g	Small 70-120g	Med-ium 120-350g	Large 350-450g	Grade No. 1 70-450g	Over size >450g	Grade No.1	per plant	SG	Fry# color	ACD @	Flesh faults (%)†	Cd¢ mg/kg f. wt.
Selection criteria														
Suitable						>47.9				>1.073	<4.9			<0.064
Atlantic	15	1.1	3.9	26.1	3.5	33.5	0.0	7	4.5	1.077	3.3	2.3	17	0.044
Crispa	30	10.7	20.9	17.0	0.0	37.9	0.0	6	14.2	1.072	3.3	3.2	7	0.047
Mondial	15	5.7	13.2	33.7	3.0	49.8	0.3	3	10.0	1.060	6.3	3.0	3	-
90-2-6 (Bliss)	20	1.8	8.3	46.3	3.6	58.3	1.0	1	6.7	1.083	4.7	1.7	13	0.035
91-1-5	24	3.1	5.9	20.3	0.0	26.2	0.0	10	10.8	1.070	5.0	2.2	57†	-
91-106-1	20	1.5	7.3	39.3	4.0	50.5	0.0	2	5.1	1.076	3.7	2.5	7	0.035
93-6-3	30	2.6	11.7	32.6	0.0	44.2	0.0	5	9.2	1.077	5.3	3.2	17	0.023
95-11-25	24	8.5	18.6	29.8	0.0	48.3	0.0	4	11.3	1.070	4.7	2.5	3	0.031
96-102-1	30	0.9	3.6	24.8	2.9	31.3	0.6	8	4.8	1.067	5.3	3.2	10	0.035
96-125-36	20	4.1	11.2	16.3	0.2	27.7	0.0	9	5.0	1.075	5.7	1.8	0†	-
Significance+		***	***	***	**	**	skew		***	***	**	*		**
LSD P = 0.05		1.9	4.2	11.6		14.4			2.2	0.004	1.6	1.0		0.020

* Tuber characteristics: **bold** typeface = suitable, plain type = questionable, *italic* = unsuitable.
# Samples assessed visually after crisping: 1 - 10, 6 = borderline, >6 = too dark for crisps.
@ ACD (after cooking darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
† Indicates significantly different flesh faults (internal disorders) from Atlantic.
¢ Cd = cadmium - maximum permitted concentration = 0.1 mg/kg fresh weight. Statistical analysis was done in combination with fresh entries (see Section 9.3.4).
+ "skew" indicates data did not fulfil assumptions of analysis of variance.

5.3.5. Selections for demonstrations of the twelfth series of crisp trials.

To be tested in demonstrations entries had to be selected in a district trial. Only two selections were made and these are shown in Table 5.3.5. These two selections have already been tested in demonstrations in the seventh series of crisp trials (Dawson & Mortimore 2000) and in the eleventh series (Section 5.2). In the eleventh series 91-106-1 (Sonic) was rejected as it had fleck in 26% of tubers (Table 5.2.2). 90-2-6 (Bliss) will be tested in comparison with new selections in the demonstrations of the next series of trials.

Table 5.3.5. Entries selected from district trials of the twelfth series of crisp trials. One of these, 90-2-6 (Bliss) will be tested in demonstrations of the 13th series of trials.

Entry	Trial selected	Comments	Scab tolerance~ (from 1st disease screening)	Re-test?
90-2-6 (Bliss)	July Feb Oct	Also selected in previous series experiments	tol	yes
91-106-1 (Sonic)	Oct	High levels of fleck found in adjacent demonstration (Section 5.2.2)	h sus	no

5.4 Thirteenth or "97" series of crisp experiments

5.4.1 Background

Breeding lines of the "97" series from the Department of Primary Industries, Victoria, Agriculture division's Potato Breeding Program were tested. Three screenings, four district trials and one demonstration were completed and are described below. Further demonstrations for the double cropping system are required to complete this series of experiments.

5.4.2. Experiment 99BU1C - October 1999 planted unreplicated screening at Margaret River.

Aims

1. To select entries suitable for the crisp market in an October planting at Margaret River. The entries comprise 95 "97" series of Australian breeding lines plus 24 yellow fleshed varieties (breeding lines and imports), plus two white fleshed imported varieties and three other earlier series breeding lines selected at the NPIC. These lines were a mixture of market types. They were compared with the standard variety Atlantic.
2. To provide high quality seed for further tests.

Results

36 entries were classified as crisp types (Table 5.4.2). 14 selections were made for further testing in next season's replicated screening. First selections had suitable tuber characteristics with specific gravity greater than 1.065 (Atlantic had a specific gravity of 1.070). The second tier of selections had questionable tuber characteristics with specific gravity higher than 1.070. All selections are shown in bold typeface in Table 5.4.2. The new variety Crispa was also selected but it will not be tested in the replicated screening as it has already been selected for the demonstration of the twelfth series.

These selections will be re-tested next season in a replicated screening. They will be tested with additional selections from the May planted winter screening (see next section).

Table 5.4.2 Tuber characteristics, yield, quality and final selections of crisp potato breeding lines in an October 1999 planted unreplicated screening at Margaret River. Selections shown in **bold**.

Entry	Tuber* charact-eristics	SG	Yield >80g (t/ha)	Cook tests (NPIC 1999)			Final selection & notes
				Crisp# colour	Boil+		
					ACD	Slough	
Atlantic	**?**	**1.070**	**38.0**	**3-5**	**1-2**	**2-3**	**Yes standard**
Crispa	**?**	**1.073**	**28.2**	**-**	**-**	**-**	**Yes new variety**
Dawmor	**?**	**1.065**	**17.1**	**-**	**-**	**-**	**Yes standard**
Saginaw Gold	yes	1.059	22.2	-	-	-	No low SG
Yukon Gold	**yes**	**1.066**	**35.4**	**-**	**-**	**-**	**Yes**
87-12-6	no	1.055	5.4	-	-	-	No low SG
89-A6-6	**yes**	**1.079**	**26.7**	**-**	**-**	**-**	**Yes**
89-88-3	**yes**	**1.074**	**18.7**	**-**	**-**	**-**	**Yes**
94-28-1	**yes**	**1.080**	**53.0**	**-**	**-**	**-**	**Yes**
95-102-20	**yes**	**1.080**	**20.3**	**-**	**-**	**-**	**Yes**
97-9-5	no	-	-	-	-	-	No unsuitable tub char's
97-9-10	yes	1.057	37.6	7	2	1	No low SG
97-10-2	?	1.066	35.1	5	2	2	No ?able tub char's
97-10-6	yes	1.076	4.6	6	2	3	No dark fry colour
97-11-18	?	1.063	28.9	6	3	1	No dark fry colour
97-23-6	no	-	-	-	-	-	No unsuitable tub char's
97-24-1	**?**	**1.077**	**11.4**	**3**	**1**	**2**	**Yes**
97-38-3	no	-	-	-	-	-	No unsuitable tub char's
97-39-5	yes	1.062	9.2	5	3	3	No low sg
97-47-3	?	1.065	26.6	3	2	1	No ?able tub char's
97-59-16	?	1.069	29.2	4	3	3	No ?able tub char's
97-59-21	**yes**	**1.072**	**13.3**	**5**	**2**	**1**	**Yes**
97-64-4	yes	1.065	22.0	6	2	1	No dark fry colour
97-74-3	yes	1.078	18.8	6	2	2	No dark fry colour
97-80-10	yes	1.060	42.5	6	1	2	No dark fry colour
97-84-6	yes	1.082	13.0	6	2	2	No dark fry colour
97-84-10	yes	1.058	12.2	4	2	2	No low SG
97-84-16	**yes**	**1.069**	**18.7**	**4**	**3**	**1**	**Yes**
97-85-3	?	1.065	68.9	4	2	2	No ?able tub char's
97-86-47	no	-	-	-	-	-	No unsuitable tub char's
97-86-53	**yes**	**1.070**	**39.1**	**5**	**1**	**2**	**Yes**
97-86-58	no	-	-	-	-	-	No unsuitable tub char's
97-87-3	**?**	**1.072**	**36.6**	**5**	**2**	**1**	**Yes**
97-97-1	**yes**	**1.064**	**35.4**	**4**	**3**	**1**	**Yes**
97-101-9	yes	1.065	43.2	6	2	1	No dark fry colour
97-105-30	**yes**	**1.070**	**67.9**	**4**	**2**	**2**	**Yes**

***** Tuber characteristics (TC); yes = suitable, ? = questionable, no = unsuitable

Crisp colour; scale 1 - 10 (light to dark), >6 unacceptable for crisps.

+ Boiling: ACD (after cooking darkening): 1 = nil, 3 = moderate, 5=general blackening
Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy

5.4.3 Experiment 00PE1 - May 2000 planted unreplicated screening at Baldivis.

Aim

To select entries suitable for the crisp market in a May planting from the 120 "97" series of breeding lines and imported varieties selected at the NPIC.

Results

Fifteen breeding lines and named varieties were classified as crisp types (Table 5.4.3.). To be selected entries had to have as suitable or questionable tuber characteristics with specific gravity greater than 1.075 and crisp colour less than 6. The three selections were 90-2-6 (Bliss – an advanced selection put into the screening as a standard), 97-10-6 and 97-84-6. Selections are shown in bold in Table 5.4.3.

Further tests

Selections from both summer and winter unreplicated screenings will be re-tested in a replicated summer screening. Winter selections will be bulked while summer selections will be re-screened.

Table 5.4.3. Quality and yield of crisp potato breeding lines in a May 2000 planted unreplicated screening at Baldivis. Selections shown in bold.

Entry	Tuber* charact-eristics	SG	Yield >80g (t/ha)	Cooking tests			Flesh faults (%)	Final selection & notes
				Crisp# colour	Boil+			
					ACD	Slough		
Atlantic	**yes**	**1.088**	**39**	**4**	**2**	**4**	**0**	**Yes, standard.**
Dawmor	no	1.076	31	3	1	3	0	No, unsuit. tub. char.
89-88-3	yes	1.077	28	7	2	2	0	No, fry too dark.
90-2-6 (Bliss)	**yes**	**1.090**	**41**	**4**	**1**	**4**	**0**	**Yes, adv. selection**
94-28-1	?	1.060	30	5	2	4	0	No, low SG.
97-9-5	yes	1.072	22	7	1	2	0	No, fry too dark.
97-10-2	?	1.073	30	3	1	2	0	No, low SG.
97-10-6	**?**	**1.081**	**29**	**5**	**1**	**3**	**0**	**Yes.**
97-47-16	no	-	-	-	-	-	-	No, unsuit. tub. char.
97-74-3	yes	1.086	37	6	2	2	0	No, fry colour borderline.
97-80-10	yes	1.058	65	6	1	2	30	No, lo SG, flesh faults.
97-84-6	**yes**	**1.075**	**39**	**5**	**2**	**3**	**0**	**Yes.**
97-84-16	yes	1.084	39	6	2	3	0	No, fry colour borderline.
97-84-18	no	-	-	-	-	-	-	No, unsuit. tub. char.
97-87-3	no	-	-	-	-	-	-	No, unsuit. tub. char.

*Tuber characteristics; Yes = suitable, ? = questionable, no = unsuitable
# Crisp colour: 1-10, >6 too dark for crisps.
ST = standard variety, TC = tuber characteristics
+ Boiling: ACD (after cooking darkening): 1 = nil, 3 = moderate, 5=general blackening
Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy

5.4.4. Experiment 00BU2 - November 2000 planted replicated screening at Margaret River.

This screening was combined with the fresh and export market screening. Some entries shown in Table 5.4.4 do not appear in the previous crisp screening results as they were previously selected for the fresh market (see Section 9.4).

Aims

1. To bulk seed of the selections from previous screenings.
2. To apply further selection pressure to reduce the number to be tested in district trials. The additional selection pressure can only be applied to summer selections.

Results

Yield and quality data are shown in Table 5.4.4. First selections had suitable tuber characteristics, specific gravity not significantly less than Atlantic with fry colour not significantly greater than Atlantic. These were Dawmor, 89-88-3, 90-2-6, 94-28-1, 97-24-1, 97-47-3, 97-74-3 and 97-105-30. Second selections had questionable tuber characteristics,

Table 5.4.4. Yield and quality of crisp entries in a November 2000 planted replicated screening at Margaret R.

Planted: 3 November 2000 Harvested: 21 March 2001 Soil type: sandy loam
Row spacing: 76 cm Soil temp. at harvest: 16°C Elevation: 100 m

Entry & tuber* characteristics	Spacing in rows (cm)	Yield (t/ha)						Rank by Grade No.1	Tuber no. per plant	Quality		
		Chats 0-70g	Small 70-120g	Medium 120-350g	Large 350-450g	Grade No. 1 70-450g	Oversize >450g			SG	Fry# colour	Flesh faults† (%)
Atlantic	15	3.7	14.4	50.6	0.8	65.8	0.0	7	6.4	1.076	3.5	0
Dawmor	24	7.5	25.4	56.4	0.0	81.8	0.5	1	11.8	1.076	3.0	10
89-88-3	24	4.4	10.3	30.9	0.4	41.5	0.0	23	8.0	1.077	5.5	10
89-A6-6	24	13.9	26.2	28.8	0.0	55.0	0.0	13	14.3	1.085	4.5	0
90-2-6	20	6.6	15.8	36.4	0.4	52.6	0.0	16	8.8	1.081	4.0	0
94-28-1	24	9.2	17.0	33.6	0.0	50.6	0.0	18	10.6	1.087	5.0	0
95-102-20	30	19.8	25.3	18.7	0.0	44.1	0.0	22	19.6	1.085	6.0	0
97-24-1	30	5.5	11.1	37.6	0.3	49.0	0.0	19	11.6	1.083	5.5	0
97-38-2	24	5.1	14.0	47.5	0.4	61.9	0.4	9	10.4	1.070	5.0	20
97-38-3	24	5.3	13.7	59.6	2.3	75.5	0.0	3	11.2	1.063	5.5	60†
97-47-3	24	3.2	8.4	31.6	1.5	41.5	0.5	24	6.5	1.074	5.0	10
97-59-21	24	8.1	13.1	39.8	1.5	54.3	0.0	14	11.2	1.066	4.5	0
97-74-3	24	11.0	20.3	40.6	0.4	61.2	0.0	10	13.1	1.089	5.0	0
97-84-6	24	7.3	15.7	32.4	0.0	48.0	0.0	21	10.9	1.085	5.0	0
97-84-16	24	7.2	17.3	56.7	1.4	75.4	0.0	4	12.2	1.076	4.5	0
97-87-3	24	3.1	15.3	35.5	0.7	51.4	0.0	17	8.1	1.075	5.0	0
97-97-1	24	4.1	7.7	30.2	2.5	40.5	0.0	25	7.1	1.067	4.5	0
97-105-30	20	3.4	13.0	56.1	1.1	70.3	0.0	6	8.1	1.076	4.5	10
Significance+		***	***	***	skew	***	skew		***	***	*	
LSD P = 0.05		3.3	7.9	16.5		16.1			2.3	0.007	2.0	

*Tuber characteristics: **bold** typeface = suitable, plain type = questionable, *italic* = unsuitable.
Samples assessed visually: 1 – 10, 6 = borderline, >6 = too dark for crisps.
† Indicates significantly different flesh faults (internal disorders) from Atlantic.
~ "skew" indicates data did not fulfil assumptions of analysis of variance.

specific gravity greater than 1.070 with fry colour less than 5.0. Only 97-84-16 qualified under these criteria. 97-24-1 was also selected as a summer fresh potato (see Experiment 00BU2 Section 9.4.4). 97-74-3 was also selected as a winter fresh potato (Section 9.4.3). These crisp selections will be tested in the district trial program with fresh potatoes.

Winter selections

Entries which have already been selected for winter performance must be tested in district trials without additional summer selection. The three selections from the winter screening (see previous section) were 90-2-6 (Bliss), 97-10-6 and 97-84-6.

5.4.5 Experiment 01PE8 – May planted district trial at Mandogalup (Perth).

Aim

To select entries suited to crisp production from a May planting. Varieties that are suited to producing high yields under cold conditions are required.

Results

Yield and quality data are shown in Table 5.4.5. High yielding varieties with dry matter not significantly less than Atlantic and acceptable fry colour are required. Tuber characteristics should be suitable, specific gravity should not be significantly less than Atlantic (i.e. > 1.083), fry colour should be not significantly darker than Atlantic (<4.9), yield should not be significantly less than Atlantic at the 1% level (i.e.> 34.1 t/ha). Varieties should also have

Table 5.4.5. Yield and quality of crisp entries in a May 2001 planted district trial at Mandogalup.

Planted: 22 May 2001 Harvested: 24 October 2001 Soil type: alkaline sand
Row spacing: 72 cm Soil temp. at harvest: 19°C Elevation: 20 m

Entry, tuber* characteristics & spacing in row (cm)		Yield (t/ha) Chats 0-70g	Small 70-120g	Medium 120-350g	Large 350-450g	Grade No. 1 70-450g	Oversize >450g	Rank by Grade No.1	Tuber no. per plant	Quality SG	Fry# color	Flesh† faults (%)	Pwd~ scab tol
Atlantic	15	5.1	12.2	27.7	1.0	41.0	0.0	4	5.1	1.086	3.3	0	tol
89-88-3	24	5.6	13.0	15.9	0.0	28.9	0.0	8	7.4	1.082	4.3	0	h sus
90-2-6	20	4.7	12.4	36.3	0.0	48.6	0.0	1	7.0	1.089	4.7	0	h sus
94-28-1	24	7.3	13.9	21.8	0.0	35.7	0.0	6	7.7	1.095	5.3	3	tol
97-10-6	30	10.2	13.5	21.4	0.0	34.9	0.0	7	12.1	1.080	5.7	0	h sus
97-24-1	30	13.3	13.6	5.4	0.0	19.0	0.0	10	8.6	1.085	6.0	0	sus
97-47-3	24	2.3	6.7	31.0	0.5	38.1	0.0	5	5.1	1.095	4.0	0	h sus
97-74-3	24	12.7	24.2	17.1	0.0	41.3	0.0	3	11.8	1.085	5.0	3	tol
97-84-6	24	9.1	18.7	26.6	0.0	45.3	0.0	2	10.6	1.085	4.3	1	h sus
97-84-16	24	17.9	14.6	11.1	0.0	25.8	0.0	9	12.2	1.088	3.3	0	h sus
Significance+		***	***	***	skew	***	ns		***	***	*	ns	
LSD P = 0.05		1.4	3.8	6.2		5.1			1.2	0.004	1.6		
LSD P = 0.01						6.9							

* Tuber characteristics: **bold** typeface = suitable, plain type = questionable, *italic* = unsuitable.
# Samples assessed visually after crisping: 1 - 10, 6 = borderline, >6 = too dark for crisps.
† Indicates significantly different flesh faults (internal disorders) from Atlantic.
+ "skew" indicates data did not fulfil assumptions of analysis of variance.
~from experiments 01PE10 & 02Al40, section 9.4.12.

tolerance to powder scab. Entries which are highly susceptible to powdery scab should not be selected. Selections were 94-28-1 (despite fry colour) and 97-74-3.

5.4.6. Experiments 01BU4A & B - July 2001 & January 2002 planted district trials at Busselton.

Aim

To select crisp entries suited for production in the double cropping system used on the Swan coastal plain. Entries were tested in a pair of trials; the first was planted in July. When this trial was harvested in December cutting seed was saved for the second trial of the pair which was planted in January. The aim is to select entries that are suited to both times of planting.

Results

July selections

Yield and quality data are shown in Table 5.4.6.1. Selections required suitable tuber characteristics with specific gravity above 1.085 (not significantly less than Atlantic) with yield greater than 35.1 t/ha (not significantly less than Atlantic), with fry colour of 4.3 or less (not significantly darker than Atlantic) with no major faults. Selections were 90-2-6, 97-74-3 and 97-84-6.

Table 5.4.6.1. Yield and quality of crisp entries in a July 2001 planted district trial at Busselton.

Planted: 27 July 2001 Harvested: 12 December 2001 Soil type: sandy loam
Row spacing: 75 cm Soil temp. at harvest: 15°C Elevation: 40 m

Entry & tuber* characteristics	Spacing in rows (cm)	Yield (t/ha)						Rank by Grade No.1	Tuber no. per plant	Quality			
		Chats 0-70g	Small 70-120g	Medium 120-350g	Large 350-450g	Grade No. 1 70-450g	Oversize >450g			SG	Fry# color	Flesh† faults (%)	
Atlantic	15	6.3	19.7	26.7	0.0	46.3	0.0	4	6.0	1.089	3.3	33	
90-2-6	20	4.5	17.2	31.9	0.0	49.1	0.0	2	7.3	1.094	4.3	3†	
94-28-1	24	6.0	11.9	30.5	0.0	42.5	0.6	6	8.1	1.093	5.7	20	
97-10-6	24	13.0	17.7	17.8	0.0	35.6	0.0	7	11.8	1.086	5.0	3†	
97-24-1	30	14.1	22.2	8.7	0.0	30.9	0.0	8	14.1	1.086	6.3	0†	
97-74-3	24	11.3	24.1	21.1	0.0	45.2	0.0	5	11.8	1.091	4.3	0†	
97-84-6	24	5.9	17.5	34.3	0.3	52.0	0.0	1	9.7	1.086	4.3	0†	
97-84-16	24	12.5	25.0	22.4	0.0	47.4	0.0	3	12.6	1.084	4.3	0†	
Significance+		***	ns	**	skew	*	skew		***	***	***	*	
LSD P = 0.05		4.5		11.1		11.2			1.4	0.004	1.1		

* Tuber characteristics: **bold** typeface = suitable, plain type = questionable, *italic* = unsuitable.
# Samples assessed visually after crisping: 1 - 10, 7 = borderline, >7 = too dark for domestic French-fries.
† Indicates significantly different flesh faults (internal disorders) from Atlantic.
+ "skew" indicates data did not fulfil assumptions of analysis of variance.

February selections

Yield and quality data are shown in Table 5.4.6.2. The trial grew well but required more water at maturity. Selections had to have improvements over Atlantic. Yield, light fry colour

and high specific gravity are especially important. 90-2-6 (Bliss) was the only entry with better performance than Atlantic. It had similar tuber characteristics, similar yield, similar fry colour but significantly higher specific gravity. Internal disorders were also significantly lower than Atlantic. After cooking darkening was also significantly less than Atlantic. Two other entries, 97-47-3 and 97-74-3, would have been selected except for their low yield. Both had significantly higher specific gravity than Atlantic with similar cooking quality and tuber characteristics.

Overall selections

It is a benefit to industry if selections perform well at both planting times. Selections from the earlier planting were 90-2-6, 97-74-3 and 97-84-6. The sole selection common to both planting times was 90-2-6 (Bliss).

Table 5.4.6.2. Yield and quality of crisp market entries in a January 2002 planted district trial at Busselton.

Planted: 25 January 2002 Harvested: 28 May 2002 Soil type: sandy loam
Row spacing: 75 cm Soil temp. at harvest: 10°C Elevation: 40 m

Entry & tuber* characteristics	Spac-ing in rows (cm)	Yield (t/ha)						Rank by Grade No.1	Tuber no. per plant	Quality			
		Chats 0-70g	Small 70-120g	Med-ium 120-350g	Large 350-450g	Grade No. 1 70-450g	Over size >450g			SG	Fry# color	ACD @	Flesh faults (%)†
Atlantic	15	3.5	10.4	35.0	0.3	45.6	0.3	1	4.4	1.083	5.7	3.0	20
Ruby Lou	20	5.6	16.3	21.9	0.0	38.2	0.0	6	6.5	1.075	5.3	2.5	0†
Saginaw Gold	30	1.6	9.4	29.1	0.0	38.5	0.0	5	6.9	1.073	5.3	2.3	3†
Yukon Gold	24	2.7	6.2	28.0	0.5	34.7	0.3	7	5.4	1.077	7.0	1.8	0†
89-88-3	24	10.2	22.2	6.0	0.0	28.1	0.0	11	9.5	1.076	5.3	2.2	0†
90-2-6 (Bliss)	20	2.7	7.7	34.5	2.1	44.3	0.0	3	5.3	1.088	5.0	1.7	0†
94-28-1	24	4.7	12.8	16.9	0.0	29.7	0.0	10	6.4	1.089	5.0	3.2	0†
97-10-6	24	17.5	16.5	1.6	0.0	18.1	0.0	13	10.6	1.081	4.7	3.5	3†
97-38-3	24	5.7	15.5	28.7	0.5	44.8	0.0	2	8.6	1.066	5.3	1.0	7
97-47-3	24	1.8	4.7	26.7	0.5	31.9	0.3	9	4.2	1.092	5.0	2.7	13
97-74-3	24	7.8	14.5	11.9	0.0	26.4	0.0	12	10.6	1.088	6.0	3.3	0†
97-84-6	24	6.9	16.6	16.3	0.2	33.2	0.0	8	8.5	1.083	4.0	4.5	0†
97-84-16	24	9.7	19.8	19.6	0.0	39.3	0.0	4	9.8	1.078	5.7	4.3	0†
Significance+		skew	***	***	skew	***	skew		***	***	*	***	
LSD P = 0.05			3.2	6.3		7.7			1.2	0.003	1.3	0.7	
LSD P = 0.01						10.4							

* Tuber characteristics: bold typeface = suitable, plain type = questionable, italic = unsuitable.
# Samples assessed visually after crisping: 1 - 10, 7 = borderline, >7 = too dark for domestic French-fries.
@ ACD (after cooking darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
† Indicates significantly different flesh faults (internal disorders) from Atlantic.
+ "skew" indicates data did not fulfil assumptions of analysis of variance.

5.4.7. Experiment 01MA11 - October 2001 planted district trial at Manjimup.

Aim

To select entries suited to the export crisp market production in an October planting. High yielding varieties with processing quality similar to Atlantic are required.

Results

The trial grew well with high rates of emergence except for 89-88-3 which had only 79% of plants emerge. Yield and quality data are shown in Table 5.4.7. Selections required suitable tuber characteristics with specific gravity above 1.082 (not significantly less than Atlantic) with yield greater than 40.7 t/ha (not significantly lower than Atlantic), with fry colour of 4.8 or less (not significantly darker than Atlantic) with no major faults. 94-28-1 would have been selected, however it had the highest cadmium level at 0.08 mg/kg fresh weight, though this was below the MPC of 0.1. Nevertheless the level was significantly higher than Delaware (see Table 9.4.7) and it would be unwise to proceed with this variety. 97-84-16 should be considered for testing in demonstrations despite low specific gravity as yield was outstanding. It should be compared with Dawmor to see whether it has any advantages. Maturity tests showed it had a one week shorter growing period and this difference was significant.

Table 5.4.7. Yield and quality of crisp entries in an October 2001 planted district trial at Manjimup.

Planted: 9 October 2001 Harvested: 20 February 2002 Soil type: sandy loam
Row spacing: 80 cm Soil temp. at harvest: 19°C Elevation: 200 m

Entry & tuber* characteristics	Spacing in rows (cm)	Yield (t/ha)						Rank	Tuber by per plant	Quality				
		Chats 0-70g	Small 70-120g	Medium 120-350g	Large 350-450g	Grade No. 1 70-450g	Oversize >450g	Grade No.1		SG	Fry# color	ACD @	Flesh faults (%)†	Cd¢ mg/kg f. wt.
Atlantic	15	5.8	10.9	37.6	0.8	49.4	0.0	6	6.1	1.086	3.0		10	
Dawmor	20	4.4	12.6	46.8	1.6	61.0	0.3	2	9.2	1.080	3.3		3	
Maris Piper	24	7.1	21.8	37.8	0.0	59.6	0.0	3	13.8	1.082	6.7		7	0.052
89-88-3	24	3.3	8.4	20.9	0.0	29.3	0.0	10	8.0	1.086	5.7		3	
94-28-1	24	3.8	14.8	26.4	0.2	41.4	0.0	9	8.3	1.090	4.0		3	0.080
97-10-6	30	5.0	17.1	24.8	0.7	42.7	0.0	8	14.1	1.087	5.3		10	
97-24-1	30	3.8	11.9	31.5	1.9	45.3	0.0	7	10.7	1.091	4.3		7	
97-47-3	30	1.3	5.6	22.7	0.0	28.3	0.3	11	5.4	1.089	5.3		0	
97-74-3	24	6.5	18.2	31.1	0.2	49.5	0.0	5	10.3	1.089	6.3		0	0.043
97-84-6	24	2.0	7.8	46.0	0.0	53.8	0.0	4	7.6	1.083	3.0		0	
97-84-16	24	4.9	20.5	40.4	0.5	61.3	0.0	1	11.2	1.081	4.3		3	0.066
Significance+		***	***	***	skew	***	skew		***	***	**		ns	***
LSD P = 0.05		1.6	6.3	9.9		8.7			1.2	0.004	1.8			0.013

* Tuber characteristics: **bold** typeface = suitable, plain type = questionable, *italic* = unsuitable.
# Samples assessed visually after crisping: 1 - 10, 7 = borderline, >7 = too dark for domestic French-fries.
@ ACD (after cooking darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
† Indicates significantly different flesh faults (internal disorders) from Atlantic.
¢ Cd = cadmium - maximum permitted concentration = 0.1 mg/kg fresh weight.
+ "skew" indicates data did not fulfil assumptions of analysis of variance.

5.4.8. Selections for demonstrations of the thirteenth series of crisp trials.

To be tested in demonstrations entries had to be selected in a district trial. The three "97" series selections are shown in Table 5.4.8 along with two earlier breeding lines.

Table 5.4.8. Entries selected for testing in demonstrations of the thirteenth series of crisp trials.

Entry	Trial selected	Comments	Scab tolerance~ (from 1st disease screening)	Re-test?
90-2-6 (Bliss)	July Feb			yes
94-28-1	May Oct	Dark fry colour, pwd scab resist Same growth period as Atlantic	tol	yes
97-74-3	May July Feb?	Dark fry colour, pwd scab resist Would have been selected in Feb except for low yield	tol	yes
97-84-6	July			yes
97-84-16	Oct	Despite low SG because hi yield		yes

5.4.9. Experiment 02AL39BU4 - November 2002 planted demonstration at Pemberton.

Aim

1. To select entries suited to the export crisp market production in a November planting.
2. To give farmers and industry representatives the opportunity to participate in the selection procedure.

Results

Along with selections from this series, three selections from the eleventh series, 89-55-6 (Dawmor), 90-2-6 (Bliss) and 95-11-25 (Minilya) were also tested. Varieties with advantages over Atlantic are required. The trial grew well. Selections had to have suitable tuber characteristics, yield similar to Atlantic (>44.8 t/ha), specific gravity greater than 1.075, fry colour less than 6 with cadmium not significantly higher than the standard variety against which it was tested. The sole selection was 90-2-6 (Bliss) which had greater specific gravity than Atlantic (1.088 verses 1.079) while other quality measures similar to Atlantic. Seeding rate for 90-2-6 (Bliss) was 25% less than for Atlantic because respective in-row spacings were 20 and 15 cm.

Table 5.4.7. Yield and quality of crisp entries in a November 2002 planted demonstration at Pemberton.

Planted: 19 November 2002 Harvested: 1 April 2003 Soil type: Karri loam
Row spacing: 75 cm Soil temp. at harvest: 16°C Elevation: 120 m

Entry, tuber* characteristics & spacing in row (cm)		Yield (t/ha)						Rank	Tuber by per plant	Quality				
		Chats 0-70g	Small 70-120g	Med-ium 120-350g	Large 350-450g	Grade No. 1 70-450g	Over size >450g	Grade No.1		SG	Fry# color	Flesh faults (%)†	Cd¢ mg/kg	Cd¢ f. wt.
Selection criteria														
Suitable						≥44.8				≥1.075	<6	<12	<0.64	<0.64
Atlantic	15	1.6	3.8	46.4	4.6	54.8	0.7	1	5.3	1.079	4	2	0.044	-
Atlantic (grower seed)	15	2.4	4.7	44.4	0.0	49.1	0.0	3	5.6	1.088	3	2	-	-
Crispa	36	5.9	8.7	30.0	0.0	38.8	0.0	6	19.6	1.077	6	2	0.047	-
Dawmor	25	5.1	8.0	40.9	0.0	48.8	0.0	4	14.0	1.069	5	6	-	-
Delaware													-	0.051
90-2-6 (Bliss)	20	1.8	4.1	45.5	0.6	50.3	0.0	2	7.5	1.088	4	2	0.004	-
94-28-1	30	1.1	2.9	29.6	2.1	34.6	0.2	8	7.3	1.078	6	0	-	0.080
95-11-25 (Minilya)	30	4.2	6.9	40.3	0.1	47.4	0.0	5	14.9	1.075	5	16†	0.031	-
97-74-3 (Vectra)	30	3.4	5.7	31.5	0.3	37.6	0.0	7	11.8	1.084	5	4	-	0.043
97-84-6	25	3.0	5.1	27.1	0.4	32.5	0.0	9	9.4	1.085	7	0	-	-
97-84-16	25	2.7	5.6	25.1	0.1	30.8	0.0	10	8.1	1.076	4	2	-	0.066
Significance													***	***
LSD (P= 0.05)													0.020	0.013

* Tuber characteristics: **bold** typeface = suitable, plain type = questionable, *italic* = unsuitable.
# Samples assessed visually after crisping: 1 - 10, 7 = borderline, >7 = too dark for domestic French-fries.
@ ACD (after cooking darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
† Indicates significantly different flesh faults (internal disorders) from Atlantic.
¢ Cd = cadmium - maximum permitted concentration = 0.1 mg/kg fresh weight.
+ "skew" indicates data did not fulfil assumptions of analysis of variance.

5.4.10. Selections from demonstrations of the thirteenth series of experiments.

This series of demonstrations has not been completed. Two demonstrations for the double cropping system of the Swan Coastal Plain are still required. These tests are important because the selections 94-28-1, 97-74-3 and 97-84-6 were selected for the double or winter crop district trials. The sole selection from the completed demonstration was 90-2-6 (Bliss).

The finding of potato virus y (PVY) in the breeding line 90-2-6 (Bliss) and the variety Maris Piper in WA resulted in a temporary halt to the program. PVY has not been found previously in serological tests in WA. This meant that these demonstrations will not be done until all material from the variety evaluation program has been tested for the virus. Sprouts from individual tubers will be tested before planting to ensure only virus free material is replanted.

5.5 Fourteenth or "98" series of crisp experiments

5.5.1. Background

Breeding lines of the "98" series from the Department of Primary Industries, Victoria, Agriculture division's Potato Breeding Program were tested. Three screenings and four district trials were completed and these experiments are discussed below.

5.5.2. Experiment 00BU1 – November 2000 planted unreplicated screening at Margaret River.

Aims

1. To select entries suitable for the crisp market in a November planting. The entries comprise 171 "98" series of Australian breeding lines plus three other earlier series breeding lines selected at the NPIC. Plus three "97" series entries from last year's screening. These were compared with the standard variety Atlantic.
2. To provide high quality seed for further tests.

Results

Forty-four entries were classified as crisp types (Table 5.5.2). Selections had suitable or questionable tuber characteristics with specific gravity of 1.073 or greater and fry colour lighter than 7. The 11 selections are shown in bold typeface in Table 5.5.2. These selections will be re-tested next season in a replicated screening. They will be tested with additional selections that will be made from the following May planted winter screening (see next section).

5.5.3. Experiment 01PE7 - May 2001 planted unreplicated screening at Baldivis.

Aims

To select entries suitable for the crisp market in a May planting at Baldivis near Perth from the "98" series of breeding lines selected at the NPIC and other varieties described for Experiment 00BU1 (see previous section).

Selections

50 breeding lines were classified as crisp types (Table 5.5.3). To be selected entries had to have suitable tuber characteristics, specific gravity 1.072 or higher, crisp colour (fry score) lighter than 7 and internal defects not greater than Atlantic. The seven selections were 98-10-11 (also selected in summer), 98-20-36, 98-20-37, 98-20-38, 98-20-39 (also selected in summer), 98-20-44 and 98-33-30. These are shown in bold in Table 5.5.3.

Selections for further testing from both summer and winter unreplicated screenings are shown in Table 5.5.4.

Table 5.5.2. Tuber characteristics, yield and quality of crisp potato breeding lines in a November 2000 planted unreplicated screening at Margaret River. Selections in **bold** typeface.

Entry	Tuber* charact-eristics	SG	Yield >80g (t/ha)	Cook tests (NPIC 2000)			Final selection & notes
				Crisp# colour	Boil+		
					ACD	Slough	
Atlantic	**yes**	**1.075**	**41**	**4**	**2**	**3**	**Yes (standard)**
97-69-5	no	-	-	-	-	-	No U.S. tuber chars
98-3-5	no	-	-	-	-	-	No U.S. tuber chars
98-10-6	**yes**	**1.078**	**89**	**5**	**3**	**2**	**Yes**
98-10-11	**yes**	**1.079**	**30**	**6**	**2**	**3**	**Yes**
98-12-18	**?**	**1.081**	**55**	**5**	**2**	**2**	**Yes**
98-12-24	**?**	**1.090**	**41**	**4**	**1**	**2**	**Yes**
98-12-26	yes	1.071	12	6	2	2	No SG <1.073
98-20-4	**?**	**1.073**	**32**	**3**	**2**	**1**	**Yes**
98-20-5	yes	1.063	58	2	3	2	No SG <1.073
98-20-28	no	-	-	-	-	-	No U.S. tuber chars
98-20-30	yes	1.072	47	5	2	1	No SG <1.073
98-20-32	no	-	-	-	-	-	No U.S. tuber chars
98-20-33	yes	1.072	46	3	2	2	No SG <1.073
98-20-37	no	-	-	-	-	-	No U.S. tuber chars
98-20-38	yes	1.063	32	6	1	2	No SG <1.073
98-20-39	no	-	-	-	-	-	No U.S. tuber chars
98-20-41	**yes**	**1.075**	**23**	**4**	**3**	**2**	**Yes**
98-20-42	yes	1.071	41	4	1	3	No SG <1.073
98-20-44	**yes**	**1.078**	**33**	**6**	**2**	**1**	**Yes**
98-20-54	no	-	-	-	-	-	No U.S. tuber chars
98-20-59	no	-	-	-	-	-	No U.S. tuber chars
98-20-61	yes	1.076	43	7	1	1	No crisp colour too dark
98-26-1	yes	1.064	32	5	3	1	No SG <1.073
98-27-3	**yes**	**1.118**	**66**	**5**	**2**	**2**	**Yes (also selected as ware)**
98-29-12	no	-	-	-	-	-	No U.S. tuber chars
98-31-6	no	-	-	-	-	-	No U.S. tuber chars
98-33-23	yes	1.068	52	6	2	1	No SG <1.073
98-33-27	**yes**	**1.081**	**82**	**5**	**1**	**3**	**Yes**
98-33-30	no	-	-	-	-	-	No U.S. tuber chars
98-33-43	**yes**	**1.074**	**35**	**5**	**2**	**1**	**Yes**
98-33-48	no	-	-	-	-	-	No U.S. tuber chars
98-33-58	**yes**	**1.077**	**27**	**2**	**2**	**1**	**Yes**
98-38-22	yes	1.059	54	-	-	-	No SG <1.073
98-49-5	no	-	-	-	-	-	No U.S. tuber chars
98-49-9	no	-	-	-	-	-	No U.S. tuber chars
98-54-33	no	-	-	-	-	-	No U.S. tuber chars
98-54-40	no	-	-	-	-	-	No U.S. tuber chars
98-54-42	no	-	-	-	-	-	No U.S. tuber chars
98-74-9	no	-	-	-	-	-	No U.S. tuber chars
98-77-6	no	-	-	-	-	-	No U.S. tuber chars
98-77-9	no	-	-	-	-	-	No U.S. tuber chars
98-80-7	yes	1.064	28	4	1	2	No SG <1.073
98-116-8	no	-	-	-	-	-	no

*Tuber characteristics (tc); yes = suitable, ? = questionable, no = unsuitable

Crisp colour; scale 1 - 10 (light to dark), >7 unacceptable for French fries.

+Boiling: ACD (after cooking darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy

Table 5.5.3. Quality and yield of crisp potato breeding lines in a May 2001 planted unreplicated screening at Baldivis. Selections are shown in bold typeface.

Entry	Tuber* charact-eristics	SG	Yield >80g (t/ha)	Cooking tests			Flesh faults (%)	Final selection & notes
				Crisp# colour	Boil+ ACD	Boil+ Slough		
Atlantic	?	1.080	65	4	1	4	0	yes, standard
97-69-5	no	-	-	-	-	-	-	no tc
98-7-17	?	1.071	49	7	1	1	0	no sg
98-10-11	yes	1.073	83	5	1	3	0	yes
98-12-26	?	1.078	38	4	1	2	0	no ? tc
98-20-4	?	1.078	30	3	2	1	0	no ? tc
98-20-30	yes	1.069	41	5	2	1	0	no sg
98-20-33	yes	1.068	50	5	2	2	0	no sg
98-20-36	yes	1.075	22	2	1	1	0	yes
98-20-37	yes	1.073	58	2	1	2	0	yes
98-20-38	yes	1.075	42	4	1	2	0	yes
98-20-39	yes	1.074	31	3	1	2	0	yes
98-20-41	?	1.075	27	2	1	2	0	no ? tc
98-20-42	no	-	-	-	-	-	-	no tc
98-20-44	yes	1.079	37	2	1	1	0	yes
98-20-54	no	-	-	-	-	-	-	no tc
98-20-59	yes	1.068	48	7	2	1	40	no sg, fry colour, internals
98-20-61	yes	1.068	22	3	1	2	0	no sg
98-21-9	no	-	-	-	-	-	-	no tc
98-22-8	no	-	-	-	-	-	-	no tc
98-26-1	no	-	-	-	-	-	-	no tc
98-27-3	yes	1.067	35	3	1	2	0	no sg
98-30-8	?	1.059	34	8	1	1	0	no sg & fry colour
98-31-6	yes	1.065	52	8	1	1	0	no sg & fry colour
98-31-24	no	-	-	-	-	-	-	no tc
98-33-27	no	-	-	-	-	-	-	no tc
98-33-28	?	1.078	29	5	1	2	0	no ? tc
98-33-30	yes	1.079	22	4	2	5	0	yes
98-33-43	no	-	-	-	-	-	-	no tc
98-33-48	yes	1.069	19	3	1	2	0	no sg
98-33-58	?	1.081	24	3	1	2	0	no ? tc
98-34-2	yes	1.058	31	4	2	1	0	no sg
98-34-8	yes	1.060	26	3	1	1	0	no sg
98-49-9	?	1.064	34	5	1	2	0	no sg
98-54-33	yes	1.062	45	7	1	2	0	no sg & fry colour
98-74-2	no	-	-	-	-	-	-	no tc
98-74-8	no	-	-	-	-	-	-	no tc
98-74-9	no	-	-	-	-	-	-	no tc
98-76-4	yes	1.059	44	7	2	2	0	no sg & fry colour
98-76-5	no	-	-	-	-	-	-	no tc

*Tuber characteristics; Yes = suitable, ? = questionable, no = unsuitable
#Crisp colour: 1-10, >7 too dark
+Boiling: ACD (after cooking darkening): 1 = nil, 3 = moderate, 5=general blackening
Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy

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Table 5.5.3 continued. Quality and yield of crisp potato breeding lines in a May 2001 planted unreplicated screening at Baldivis. Selections are shown in bold typeface.

Entry	Tuber* charact-eristics	SG	Yield >80g (t/ha)	Cooking tests			Flesh faults (%)	Final selection & notes
				Crisp# colour	Boil+			
					ACD	Slough		
Atlantic	?	1.080	65	4	1	4	0	
98-76-9	?	1.056	23	7	2	2	0	no sg & fry colour
98-76-13	yes	1.053	34	9	1	1	0	no sg & fry colour
98-76-15	no	-	-	-	-	-	-	no sg
98-77-6	?	1.074	28	4	1	2	0	no ? tc
98-77-7	yes	1.068	23	6	1	2	0	no sg
98-77-8	yes	1.061	23	8	1	1	0	no sg & fry colour
98-77-9	no	-	-	-	-	-	-	no tc
98-80-2	no	-	-	-	-	-	-	no tc
98-116-2	no	-	-	-	-	-	-	no tc
98-116-8	no	-	-	-	-	-	-	no tc

*Tuber characteristics; Yes = suitable, ? = questionable, no = unsuitable
#Crisp colour: 1-10, >7 too dark
+Boiling: ACD (after cooking darkening): 1 = nil, 3 = moderate, 5=general blackening
Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy

5.5.4. Experiment 01BU2 – November 2001 planted replicated screening at Margaret River.

Background

This screening combined breeding lines selected for the crisp, French-fry, fresh and export markets. Two entries shown in Table 5.5.4, 98-7-14 and 98-54-59, do not appear in the previous crisp screening results as they were selected from the fresh market stream (see Section 9.5.2).

Aims

1. To bulk seed of the lines selected in the previous screenings.
2. To apply further selection pressure to reduce the number to be tested in district trials. The additional selection pressure can only be applied to summer selections. Entries which have been selected for their winter performance will be tested in district trials without regard for their performance in this summer screening.

Results

Yield and quality data are shown in Table 5.5.4. The screening grew well and was very high yielding as shown by Atlantic's Grade 1 yield of 83 t/ha. Of the 53 breeding lines 28 were categorised as crisp types. Breeding lines with crisping potential only are shown here. Selections had suitable tuber characteristics, specific gravity greater than 1.073 (not significantly less than Atlantic), yield greater than 47.1 t/ha {not highly significantly less than Atlantic (P= 0.01)} with acceptable fry colour (less than score 7) and no serious defects. The seven selections were 98-10-11, 89-20-39, 98-33-27, 98-33-28, 98-33-30, 98-33-58 and 98-77-6.

Table 5.5.4. Yield and quality of crisp entries in a November 2001 planted replicated screening at Margaret River.

Planted: 1 November 2001 Harvested: 20 March 2002 Soil type: sandy loam
Row spacing: 76 cm Soil temp. at harvest: 20°C Elevation: 100 m

Entry, tuber* characteristics and spacing (cm)		Yield (t/ha)						Rank by Grade No.1	Tuber no. per plant	Quality			
		Chats 0-70g	Small 70-200g	Med-ium 200-350g	Large 350-450g	Grade No. 1 70-450g	Over size >450g			SG	Slough ~	Fry# colour	Flesh† faults
Atlantic	15	3.4	18.5	62.5	2.3	83.4	0.0	5	7.8	1.079	2.3	4.5	0
Dawmor	24	8.0	30.7	48.3	0.7	79.6	0.0	6	14.8	1.074	1.3	4.5	0
98-7-14	24	3.4	25.5	39.8	0.0	65.3	0.0	14	12.1	1.071	1.8	5.0	0
98-10-6	24	3.5	6.5	53.3	10.4	70.2	4.4	11	10.0	1.078	2.0	5.5	30*
98-10-11	24	4.5	26.2	75.0	0.8	101.9	0.0	1	14.9	1.079	2.8	4.0	10
98-12-18	24	6.7	25.8	73.5	0.0	99.2	0.9	2	16.0	1.080	1.5	4.5	60*
98-12-24	24	9.3	15.8	51.2	3.8	70.8	3.2	10	12.1	1.073	2.5	4.5	100*
98-12-26	30	6.8	18.2	27.7	0.0	46.0	0.0	27	12.3	1.070	1.0	4.5	40*
98-20-4	30	8.2	15.4	31.0	0.0	46.3	0.0	26	12.9	1.070	1.0	6.0	0
98-20-28	24	7.7	24.1	26.6	0.0	50.7	0.0	25	12.5	1.075	1.5	6.0	0
98-20-36	30	8.4	15.7	21.3	0.0	37.0	0.0	29	11.8	1.066	1.0	4.5	10
98-20-37	24	5.0	15.3	46.7	0.8	62.8	1.1	15	10.1	1.069	1.5	4.5	0
98-20-38	24	10.8	20.9	22.4	0.0	43.4	0.0	28	11.3	1.067	1.8	5.5	0
98-20-39	30	6.2	15.7	38.9	0.4	54.9	0.0	22	12.6	1.074	1.3	4.5	0
98-20-41	30	4.9	15.0	45.0	2.5	62.5	3.6	16	13.9	1.069	1.5	4.5	70*
98-20-44	30	9.9	10.3	22.5	0.7	33.5	0.0	30	14.2	1.069	1.3	3.5	20
98-33-23	24	6.1	12.9	47.5	1.2	61.5	0.0	17	10.0	1.064	1.8	6.5	0
98-33-27	24	6.3	17.3	79.9	1.8	99.0	0.0	3	14.2	1.079	3.3	4.0	0
98-33-28	30	9.7	26.1	43.8	0.0	69.9	0.0	12	17.0	1.076	1.0	3.0	0
98-33-30	30	4.9	11.5	60.5	3.7	75.7	2.9	8	12.9	1.079	3.5	3.0	20
98-33-43	30	8.9	18.4	42.1	0.0	60.5	0.0	18	15.8	1.067	2.0	3.5	10
98-33-58	24	5.5	17.0	40.2	1.5	58.7	0.9	20	9.8	1.078	1.3	4.0	0
98-34-1	24	11.0	23.3	29.8	0.0	53.1	0.0	23	12.5	1.069	1.0	5.5	0
98-34-2	30	6.6	22.7	67.3	4.6	94.6	0.4	4	18.5	1.069	1.3	5.5	0
98-34-8	24	11.6	29.8	46.6	0.0	76.4	0.0	7	17.1	1.068	1.3	5.5	30*
98-54-33	24	19.8	37.1	20.7	0.0	57.8	0.0	21	18.3	1.069	2.8	4.5	0
98-54-59	24	9.2	28.1	31.4	0.4	59.9	0.0	19	13.1	1.067	1.8	4.5	0
98-77-6	30	6.0	14.2	51.1	1.8	67.1	0.0	13	12.5	1.086	3.3	4.5	10
98-80-7	24	6.9	19.6	50.3	1.1	71.0	0.0	9	11.6	1.066	1.5	3.5	20
98-116-2	30	13.6	30.6	20.9	0.0	51.5	0.0	24	18.6	1.070	2.0	4.0	0
Significance+		***	***	***	skew	***	skew		***	***	***	ns	*
LSD P = 0.05		4.0	8.5	24.5		26.9			3.0	0.006	1.1		
LSD P = 0.01						36.3							

***** Tuber characteristics: **bold** typeface = suitable, plain type = questionable, *italic* = unsuitable.
~ Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy.
# Samples assessed visually: 1 - 10, 6 = borderline, >6 = too dark.
† Asterisk indicates significantly different level of internal disorders compared with Atlantic.
+ "skew" indicates data did not fulfil assumptions of analysis of variance.

Winter selections

Winter performance must be considered when selecting material for district trials. An additional seven selections from the winter screening (see previous section) which will also be tested in district trials are 98-10-11 (also selected in summer), 98-20-36, 98-20-37, 98-20-38, 98-20-39 (also selected in summer), 98-20-44 and 98-33-30 (also selected in summer).

Selections for district trials
These summer and winter crisp selections will be tested in the district trial program in combined trials with fresh market potatoes.

Crosses worth repeating
Five entries were selected from the cross 98-20 (Coastal Chip x 90-7-17. Five entries were also selected from the cross 98-33 (Denali x 90-7-17). Both crosses should be repeated.

5.5.5. Experiment 02AL37PE – May planted district trial at Mandogalup.

Aim

To select entries suited to crisp production from a May planting. New varieties, which produce high yield, high dry matter and light fry colour under cold conditions with tolerance to powdery scab, are required.

Results

The trial grew well through hard, windy, cold conditions; however tuber size was reasonable. Emergence rates were high except for KT3 (54%), 98-20-36 (57%) and 98-116-2 (69%). Yield and quality data are shown in Table 5.5.5. Yield of Atlantic was low at just 28 t/ha: average yield for the trial was 33 t/ha. Last year Atlantic yielded 41 t/ha and trial average was 36 t/ha. To be selected entries had to have suitable tuber characteristics, specific gravity not highly significantly less than Atlantic (i.e. > 1.081) and fry colour not significantly darker than Atlantic. Only 6 entries other than Atlantic had suitable tuber characteristics for crisping. Of these 98-20-36, 98-20-39 and 98-27-3 had specific gravity highly significantly lower than Atlantic. Of the remaining three entries, 98-10-11 and 98-20-44 had similar performance to Atlantic while 98-33-58 had darker fry colour. All three entries were more susceptible to powdery scab than Atlantic. They should not be re-tested.

5.5.6. Experiments 02AL37BUA&B – July and February planted district trials at Jindong.

Aim

To select crisp entries suited for production in the double cropping system used on the Swan coastal plain. Entries were tested in a pair of trials; the first was planted in July. When this trial was harvested in December cutting seed was saved for the second trial of the pair which was planted in February. The aim is to select entries that are suited to both times of planting.

Results

July
The aim is to select varieties suited to spring production. The current standard is Atlantic. Selections needed suitable tuber characteristics, specific gravity not significantly less than Atlantic (> 1.078) with fry colour less than 4.5. The trial did not close, probably due to a combination of pesticide phytotoxicity and insufficient fertiliser. Therefore yield was not used as a selection criterion. Only three entries had specific gravity not significantly less than

Atlantic. Of these, just one, 98-33-58, had suitable tuber characteristics. However its fry colour was significantly darker than Atlantic so it was not selected.

February

This trial was damaged by cattle just before row closure; subsequently it didn't grow very well and died early. Yields were low, averaging 15 t/ha for Grade No 1 compared with last years trial's average of 35 t/ha (Section 5.4.6 Experiment 01BU4B). Therefore yield will not be used as a selection criterion. Selection criteria used were suitable tuber characteristics, specific gravity greater than 1.075 (not significantly less than Atlantic, P= 0.01), fry colour less than 6 and flesh disorders less than 19%. No entries met these criteria.

Table 5.5.5. Yield and quality of crisp entries in a May 2002 planted district trial at Mandogalup.

Planted: 17 May 2002 Harvested: 17 October 2002 Soil type: alkaline sand
Row spacing: 70 cm Soil temp. at harvest: 19°C Elevation: 20 m

Entry tuber* characteristics & spacing in rows (cm)		Yield (t/ha)						Rank by Grade No.1	Tuber no. per plant	Quality				
		Chats 0-70g	Small 70-120g	Medium 120-350g	Large 350-450g	Grade No. 1 70-450g	Oversize >450g			SG	Fry# color	Flesh faults †	Pwd scab‡	ACD @
Atlantic	15	4.4	10.0	17.9	0.0	27.9	0.0	9	4.1	1.087	3.3	0	tol	1.3
Eben	24	3.8	8.9	28.9	3.9	41.6	2.0	5	7.3	1.080	5.0	0	tol	2.2
KT3	24	2.3	4.4	44.0	7.2	55.6	0.7	2	11.3	1.054	8.7	63†	h sus	1.2
PO3	24	2.4	2.4	38.4	11.9	52.7	15.5	3	7.7	1.074	8.0	17†	h sus	1.3
98-10-11	24	5.3	13.0	32.7	0.5	46.2	0.4	4	8.2	1.082	5.0	0	h sus	1.2
98-20-28	24	5.4	9.8	12.4	0.0	22.2	0.0	12	6.3	1.081	4.3	3	h sus	1.3
98-20-36	30	2.9	5.3	13.4	0.3	18.9	0.0	14	9.0	1.078	5.0	3	sus	1.0
98-20-37	24	5.4	9.6	26.8	2.6	39.0	1.7	6	7.7	1.078	3.7	3	h sus	1.5
98-20-38	24	3.6	7.2	22.4	0.3	29.9	0.0	7	5.4	1.079	4.0	3	h sus	1.2
98-20-39	30	5.4	9.6	11.3	0.0	20.9	0.0	13	6.6	1.080	4.7	3	h sus	1.0
98-20-44	30	7.3	12.2	13.9	0.0	26.0	0.0	10	8.1	1.085	4.3	0	h sus	1.2
98-27-3	30	4.5	9.3	45.9	2.0	57.2	0.4	1	11.3	1.076	5.7	0	h sus	1.8
98-33-30	30	2.4	5.7	18.5	1.1	25.3	0.0	11	5.6	1.087	5.0	3	sus	1.2
98-33-58	30	2.0	5.1	23.5	0.3	28.8	0.0	8	5.8	1.092	5.3	10	h sus	2.2
98-116-2	40	5.0	4.6	4.6	0.0	9.3	0.0	15	7.7	1.080	4.0	0	tol	1.2
Significance+		***	***	***	skew	***	skew		***	***	***	*	***	***
LSD P = 0.05		2.2	3.6	7.5	7.3	6.8			2.0	0.004	1.4			0.5
LSD P = 0.01						9.2				0.006				

* Tuber characteristics: **bold** typeface = suitable, plain type = questionable, *italic* = unsuitable.
# Samples assessed visually after crisping: 1 - 10, 6 = borderline, >6 = too dark for crisps.
† indicates significantly different flesh disorders from Atlantic.
‡ Powdery scab reaction: tol = tolerant, sus = susceptible h = highly, Data from disease screening.
+ "skew" indicates data did not fulfil assumptions of analysis of variance.

Table 5.5.6.1. Yield and quality of crisp entries in a July 2002 planted district trial at Jindong.

Planted: 2 July 2002 Harvested: 28 November 2002 Soil type: clay loam
Row spacing: 75 cm Soil temp. at harvest: 19°C Elevation: 40 m

Entry, tuber* characteristics and spacing (cm)		Yield (t/ha)						Rank by Grade No.1	Tuber no. per plant	Quality			
		Chats 0-70g	Small 70-200g	Med-ium 200-350g	Large 350-450g	Grade No. 1 70-450g	Over size >450g			SG	Fry# colour	Flesh† faults	ACD @
Selection criteria													
Suitable										>1.078	<4.5		
Atlantic	15	13.4	13.4	3.8	0.0	17.2	0.0	6	5.5	1.083	3.0	0	1.5
Eben	24	10.9	14.2	9.2	0.0	23.4	0.0	3	8.6	1.068	6.0	0	2.0
PO3	24	7.1	17.1	24.4	0.2	41.7	0.0	1	8.8	1.066	6.0	7	1.5
98-10-11	24	11.4	14.5	4.7	0.0	19.1	0.0	4	8.4	1.075	4.7	0	1.5
98-20-28	24	14.7	12.9	0.8	0.0	13.7	0.0	8	8.3	1.073	4.7	0	1.5
98-20-36	30	9.0	8.7	1.3	0.0	10.0	0.0	13	7.1	1.071	3.7	0	1.2
98-20-37	24	6.3	13.3	10.3	0.0	23.6	0.0	2	6.4	1.072	3.0	3	2.2
98-20-38	24	5.0	12.0	6.3	0.0	18.3	0.0	5	5.1	1.068	4.3	0	1.2
98-20-39	30	8.6	4.5	0.1	0.0	4.6	0.0	15	5.7	1.070	4.3	-	1.0
98-20-44	30	10.5	10.4	0.7	0.0	11.1	0.0	10	7.7	1.076	4.0	0	1.2
98-33-27	24	14.8	8.5	1.6	0.0	10.1	0.0	12	8.1	1.076	5.0	0	1.3
98-33-28	36	10.0	9.6	1.5	0.0	11.0	0.0	11	9.2	1.081	5.3	0	1.3
98-33-30	30	7.5	9.3	2.0	0.0	11.3	0.0	9	6.0	1.081	5.0	0	2.0
98-33-58	30	4.2	10.2	5.4	0.0	15.6	0.0	7	5.3	1.085	4.7	0	2.7
98-54-33	30	17.6	8.4	1.3	0.0	9.7	0.0	14	11.8	1.064	7.3	10	1.7
98-116-2	40	7.3	0.7	0.0	0.0	0.7	0.0	16	6.8	1.070	4.0	-	1.0
Significance+		***	***	skew	skew	***			***	***	***	ns	***
LSD P = 0.05		2.7	2.6			3.8			1.3	0.005	1.5		0.5

* Tuber characteristics: **bold** typeface = suitable, plain type = questionable, *italic* = unsuitable.
# Samples assessed visually: 1 - 10, 6 = borderline for crisps, >6 = too dark.
† Asterisk indicates significantly different level of internal disorders compared with Atlantic.
@ ACD (after cooking darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
+ "skew" indicates data did not fulfil assumptions of analysis of variance.

Table 5.5.6.2. Yield and quality of crisp entries in a February 2003 planted district trial at Jindong.

Planted: 4 February 2003 Harvested: 11 June 2003 Soil type: clay loam
Row spacing: 75 cm Soil temp. at harvest: 8°C Elevation: 40 m

Entry, tuber* characteristics and spacing (cm)		Yield (t/ha) Chats 0-70g	Small 70-200g	Med-ium 200-350g	Large 350-450g	Grade No. 1 70-450g	Over size >450g	Rank by Grade No.1	Tuber no. per plant	Quality SG	Fry# colour	Flesh† faults	ACD @
Selection criteria													
suitable										>1.075	<6	<19	
Atlantic	15	3.4	8.5	16.8	0.2	25.5	0.0	1	4.0	1.079	5.0	2.5	2.3
Eben	24	2.5	8.9	12.5	0.0	21.4	0.0	3	4.8	1.078	5.7	1.8	2.3
Ruby Lou	20	9.8	12.5	4.1	0.0	16.6	0.0	5	6.6	1.069	4.7	1.0	2.2
98-10-11	24	4.2	6.0	18.4	0.0	24.4	0.0	2	5.5	1.075	5.7	1.7	2.3
98-20-28	24	5.8	8.3	3.0	0.0	11.3	0.0	9	4.7	1.080	4.7	1.0	1.8
98-20-36	30	2.2	7.7	3.6	0.0	11.3	0.0	8	6.1	1.073	4.7	1.0	1.3
98-20-37	24	4.2	7.8	8.4	0.0	16.3	0.0	6	6.1	1.076	4.7	1.3	1.8
98-20-38	24	2.4	7.5	8.3	0.0	15.8	0.0	7	5.5	1.075	5.0	1.0	3.0
98-20-39	30	3.9	4.9	3.1	0.0	8.0	0.0	12	5.8	1.078	5.0	1.2	1.5
98-20-44	30	4.7	6.6	2.2	0.0	8.8	0.0	10	6.4	1.077	4.7	1.0	2.2
98-27-3	30	4.4	8.5	10.3	0.0	18.8	0.0	4	6.3	1.072	4.3	1.3	3.2
98-33-58	30	6.8	4.8	0.4	0.0	5.2	0.0	13	6.1	1.083	4.3	1.2	3.5
98-116-2	40	7.5	6.7	2.1	0.0	8.8	0.0	11	8.5	1.072	4.0	1.3	2.0
Significance+		***	*	***	skew	***			*	***	*	skew	***
LSD P = 0.05		2.0	3.7	4.6		5.7			2.0	0.003	0.9		0.7
LSD P = 0.01										0.004			

* Tuber characteristics: **bold** typeface = suitable, plain type = questionable, *italic* = unsuitable.
# Samples assessed visually: 1 - 10, 6 = borderline for crisps, >6 = too dark.
† Asterisk indicates significantly different level of internal disorders compared with Atlantic.
@ ACD (after cooking darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
+ "skew" indicates data did not fulfil assumptions of analysis of variance.

5.5.7. Experiment 02AL37MA – November planted district trial at Pemberton.

Aim

To select entries suited to crisp production from a November planting. High yielding, round potatoes with processing quality as good as or better than Atlantic are needed.

Results

The trial grew well and emergence rates were high (>87%) except for 97-86-46 (67%) and 98-54-33 (78%). Yield and quality data are shown in Table 5.5.7. To be selected entries had to have suitable tuber characteristics with specific gravity of 1.069 or higher (not significantly less than Atlantic) with yield greater than 33.4 t/ha (not highly significantly less than Atlantic), with fry colour less than 5.5 with no major faults. Cadmium could not be significantly higher than Atlantic. Selections (before cadmium results were available) were 98-10-11, 98-27-3 and 98-33-27.

Table 5.5.7. Yield and quality of crisp entries in a November 2002 planted district trial at Pemberton.

Planted: 7 November 2002 Harvested: 20 March 2003 Soil type: Karri loam
Row spacing: 75 cm Soil temp. at harvest: 17°C Elevation: 200 m

Entry tuber* characteristics & spacing in rows (cm)		Yield (t/ha)						Rank by Grade No.1	Tuber no. per plant	Quality				
		Chats 0-70g	Small 70-120g	Medium 120-350g	Large 350-450g	Grade No. 1 70-450g	Oversize >450g			SG	Fry# color	ACD @	Flesh faults †	Cd ¢
Selection criteria														
						<33.4				≤1.069	<5.5			
Atlantic	15	5.3	10.0	32.0	0.0	42.0	0.0	11	5.2	1.074	4.3	2.0	13	
Eben	24	4.0	10.5	22.7	0.2	33.4	0.0	16	6.4	1.070	4.0	3.3	7	
Ruby Lou	20	5.3	13.3	43.2	0.7	57.2	0.6	2	7.7	1.069	4.3	2.7	27	
TK51.6	24	15.3	5.3	0.6	0.0	5.9	0.0	21	11.7	1.085	8.7	2.5	0†	
97-86-46	20	2.9	6.0	39.6	2.1	47.8	3.7	6	7.8	1.074	6.0	3.0	3	
98-10-11	24	6.9	16.6	40.5	0.7	57.7	0.0	1	10.4	1.074	5.0	1.8	0†	
98-20-28	24	3.7	13.1	33.0	0.5	46.6	0.0	9	8.7	1.081	5.3	3.2	13	
98-20-36	30	5.3	9.2	30.6	1.1	40.9	0.3	12	9.8	1.068	4.0	2.7	3	
98-20-37	24	5.8	12.0	31.8	1.3	45.1	0.3	10	8.2	1.073	4.0	2.7	3	
98-20-38	30	3.8	6.0	25.6	5.1	36.8	1.5	15	6.9	1.063	4.7	3.0	17	
98-20-39	30	7.4	13.6	16.8	0.5	30.9	0.0	18	9.6	1.075	5.0	1.2	0†	
98-20-44	30	5.8	13.9	25.5	0.0	39.4	0.0	14	10.2	1.075	5.0	3.7	7	
98-27-3	20	2.5	6.4	36.8	4.8	48.0	2.6	5	5.2	1.079	3.7	4.5	20	
98-32-4	24	1.7	5.3	36.4	5.7	47.4	2.5	7	6.0	1.066	6.0	3.0	17	
98-33-27	24	9.7	16.3	30.4	0.0	46.7	0.0	8	11.3	1.076	4.7	2.8	3	
98-33-30	30	2.9	8.3	35.5	4.4	48.2	2.1	3	8.2	1.076	5.0	3.3	37†	
98-33-58	24	12.1	13.3	13.3	0.0	26.6	0.0	19	9.9	1.083	4.7	3.5	13	
98-54-33	36	7.0	10.9	21.8	0.2	33.0	0.0	17	16.7	1.072	4.7	2.0	0†	
98-77-6	30	4.6	9.6	38.0	0.6	48.2	0.0	4	9.8	1.090	4.0	2.7	3	
98-80-11	40	8.1	16.1	24.2	0.0	40.3	0.0	13	16.4	1.070	5.3	3.2	20	
98-116-2	40	6.2	10.5	15.0	0.0	25.6	0.0	20	11.3	1.072	4.7	2.8	0†	
Significance+		***	***	***	skew	***	skew		***	***	***	***		
LSD P = 0.05		2.9	3.3	9.0		8.6			1.8	0.005	1.2	1.0		

* Tuber characteristics: **bold** typeface = suitable, plain type = questionable, *italic* = unsuitable.
# Samples assessed visually after crisping: 1 - 10, 6 = borderline, >6 = too dark for crisps.
@ ACD (after cooking darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
† indicates significantly different flesh disorders from Atlantic.
¢ Cd = cadmium - maximum permitted concentration = 0.1 mg/kg fresh weight.
+ "skew" indicates data did not fulfil assumptions of analysis of variance.

5.5.8. Selections for demonstrations of the fourteenth series of crisp trials.

To be selected for demonstrations entries had to be selected in a district trial. The three "98" series selections are shown in Table 5.5.8. The selections were all from a summer grown trial. At this time powdery scab disease is not a major problem and so the selections were chosen despite their susceptibility to the disease.

Table 5.5.8. Entries selected for testing in demonstrations of the fourteenth series of crisp trials.

Entry	Trial selected	Comments	Scab tolerance~ (from 1st disease screening)	Re-test?
98-10-11	Nov	Cadmium samples yet to be analysed	h susc	yes
98-27-3	Nov	Cadmium samples yet to be analysed	h susc	yes
98-33-27	Nov	Cadmium samples yet to be analysed	h susc	yes

~ See Section 9.5.8.

5.6 Fifteenth or "99" series of crisp market experiments

5.6.1. Background

Breeding lines of the "99" series from the Department of Primary Industries, Victoria, Agriculture division's Potato Breeding Program were tested. Three screenings were completed and are described below. A May 2003 district trial was to have been planted but this was not planted due to problems with viral contamination of some breeding lines (See Section 9.1).

5.6.2. Experiment 01BU1 – October 2001 planted unreplicated screening at Margaret River.

Aims

1. To select entries suitable for crisp processing for October planting. The entries comprise 174 "99" series Australian breeding lines plus three other, earlier series breeding lines selected at the NPIC. These were compared with the standard variety Atlantic.
2. To provide high quality seed for further tests.

Results

Selections from NPIC

280 selections were sent to WA and 115 were categorised as crisps. 100 were selected for screening in WA. 15 were rejected due to unsuitable cooking quality (low SG (<1.075) or dark fry colour).

Screening in WA

At harvest of the screening eighty-nine entries were classified as crisp types (Table 5.6.2). Selections had suitable tuber characteristics with specific gravity of 1.074 or greater with fry

Table 5.6.2 Tuber characteristics, yield and quality of crisp potato breeding lines in an October 2001 planted unreplicated screening at Margaret River. Selections in **bold** typeface.

Entry	Tuber* charact-eristics	SG	Yield >80g (t/ha)	Cook tests (NPIC 2000)			Final selection & notes
				Crisp#	Boil+		
				colour	ACD	Slough	
Selection criterion	yes	>1.074		<7			
Atlantic	yes	1.075	92	-	-	-	
97-101-7	yes	1.074	74	-	-	-	No, low SG
98-26-4	no	-	-	-	-	-	No, TC
98-54-50	yes	1.063	35	-	-	-	No, low SG
99-1-17	no	-	-	-	-	-	No, TC
99-5-1	?	1.068	55	7	1	2	No, TC, low SG, dk fry
99-5-3	yes	1.070	81	7	1	2	No, low SG, dk fry
99-5-4	yes	1.063	88	5	1	1	No, low SG
99-5-9	?	1.060	49	-	-	-	No, TC
99-5-11	yes	1.072	20	4	1	1	No, low SG
99-5-14	yes	1.078	53	5	1	2	**Yes**
99-5-19	yes	1.067	39	6	1	3	No, low SG
99-5-20	no	-	-	-	-	-	No, TC
99-11-5	yes	1.079	64	7	1	3	No, dk fry
99-11-7	no	-	-	-	-	-	No, TC
99-11-8	yes	1.087	75	5	1	2	**Yes**
99-14-1	no	-	-	-	-	-	No, TC
99-14-10	yes	1.083	54	3	1	2	**Yes**
99-16-5	no	-	-	-	-	-	No, TC
99-18-6	yes	1.086	75	3	1	2	**Yes**
99-19-3	yes	1.064	33	3	2	3	No, low SG
99-21-2	yes	1.070	59	6	1	3	No, low SG
99-21-6	no	-	-	-	-	-	No, TC
99-23-3	yes	1.083	94	6	1	1	**Yes**
99-23-5	yes	1.077	38	6	1	2	**Yes**
99-23-11	yes	1.074	45	5	1	1	No, low SG
99-24-3	yes	1.074	32	4	3	1	No, low SG
99-27-20	yes	1.067	78	6	1	3	No, low SG
99-28-12	yes	1.077	77	3	2	3	**Yes**
99-30-4	no	-	-	-	-	-	No, TC
99-34-1	yes	1.070	64	4	2	2	No, low SG
99-34-8	yes	1.068	41	2	2	2	No, low SG
99-34-17	yes	1.065	40	7	2	2	No, low SG
99-34-24	yes	1.064	49	4	3	2	No, low SG
99-35-4	?	1.070	47	7	1	2	No, TC, low SG
99-35-8	?	1.068	54	5	2	1	No, low SG
99-35-14	yes	1.084	50	5	2	2	**Yes**
99-35-22	yes	1.076	37	3	1	3	**Yes**
99-37-7	yes	1.082	69	6	1	2	**Yes**
99-37-8	yes	1.078	61	4	1	2	**Yes**
99-37-10	no	-	-	-	-	-	No, TC
99-37-16	no	-	-	-	-	-	No, TC
99-38-1	yes	1.065	45	7	1	1	No, low SG, dk fry
99-38-5	no	-	-	-	-	-	No, TC
99-38-8	yes	1.059	57	3	3	1	No, low SG

*Tuber characteristics (tc); yes = suitable, ? = questionable, no = unsuitable

Crisp colour; scale 1 - 10 (light to dark), >7 unacceptable for French fries.

+Boiling: ACD (after cooking darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy

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Table 5.6.2 continued. Tuber characteristics, yield and quality of fresh domestic market potato breeding lines in an October 2001 planted unreplicated screening at Margaret River. Selections in **bold** typeface.

Entry	Tuber* charact-eristics	SG	Yield >80g (t/ha)	Cook tests (NPIC 2001)			Final selection & notes
				Crisp# colour	Boil+ ACD	Boil+ Slough	
Selection criterion	yes	>1.074		<7			
99-42-12	no	-	-	-	-	-	No, TC
99-42-13	yes	1.080	54	5	1	1	**Yes**
99-44-2	no	-	-	-	-	-	No, TC
99-44-6	no	-	-	-	-	-	No, TC
99-44-10	no	-	-	-	-	-	No, TC
99-44-12	yes	1.061	48	3	4	1	No, low SG
99-44-16	yes	1.063	57	5	2	2	No, low SG
99-44-29	yes	1.068	64	5	4	1	No, low SG
99-46-19	yes	1.073	111	6	2	1	No, low SG
99-46-21	yes	1.078	91	7	1	1	No, dk fry
99-50-1	no	-	-	-	-	-	No, TC
99-50-7	no	-	-	-	-	-	No, TC
99-50-16	yes	1.085	72	6	2	2	**Yes**
99-50-27	yes	1.100	44	5	2	2	**Yes**
99-51-2	yes	1.079	73	5	1	1	**Yes**
99-51-3	yes	1.081	74	-	-	-	No, TC
99-51-4	no	-	-	-	-	-	No, TC
99-51-11	yes	1.076	40	6	1	2	**Yes**
99-52-1	yes	1.064	101	5	1	2	No, low SG
99-52-4	yes	1.067	48	-	-	-	No, TC
99-53-6	yes	1.081	58	4	1	1	**Yes**
99-53-14	yes	1.070	51	2	1	2	No, low SG
99-53-18	yes	1.073	31	7	2	3	No, low SG, dk fry
99-58-18	yes	1.060	63	6	2	2	No, low SG
99-58-22	yes	1.077	79	5	3	3	**Yes**
99-58-23	yes	1.070	61	5	2	3	No, low SG
99-58-24	yes	1.074	88	5	1	2	No, low SG
99-58-25	yes	1.071	107	6	3	2	No, low SG
99-62-3	no	-	-	-	-	-	No, TC
99-63-6	yes	1.080	85	7	1	3	No, dk fry
99-63-7	no	-	-	-	-	-	No, TC
99-64-5	yes	1.058	16	4	3	2	No, low SG
99-64-10	no	-	-	-	-	-	No, TC
99-72-1	yes	1.073	45	5	2	3	No, low SG
99-72-4	yes	1.075	73	2	2	2	**Yes**
99-72-7	yes	1.083	51	5	2	2	**Yes**
99-72-16	yes	1.062	23	6	2	1	No, low SG
99-78-6	yes	1.088	52	2	2	2	**Yes**
99-78-9	yes	1.082	53	2	1	2	**Yes**
99-78-34	yes	1.070	43	5	2	2	No, low SG
99-78-52	yes	1.082	76	2	2	2	**Yes**
99-79-13	yes	1.065	61	5	1	2	No, low SG
99-79-17	yes	1.080	98	4	1	1	**Yes**
99-81-4	yes	1.064	75	3	1	2	No, low SG
99-81-6	yes	1.074	118	5	1	2	No, low SG, dk yellow flesh

*Tuber characteristics (tc); yes = suitable, ? = questionable, no = unsuitable

Crisp colour; scale 1 - 10 (light to dark), >7 unacceptable for French fries.

+Boiling: ACD (after cooking darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy.

colour lighter than 7. The 24 selections for further testing in next season's replicated screening are shown in bold typeface in Table 5.6.2.

These selections will be re-tested next season in a replicated screening. They will be tested with additional selections that will be made from the following May planted winter screening (see next section).

5.6.3. Experiment 02AL35 - May 2002 planted unreplicated screening at Baldivis.

Aims

To select entries suitable for the crisp market in a May planting at Baldivis near Perth from the "99" series of breeding lines selected at the NPIC and other varieties described for Experiment 01BU1 (see previous section).

Results

23 entries were classified as crisp processing types (Table 5.6.3). To be selected entries had to have suitable tuber characteristics, specific gravity greater than 1.075 with crisp colour (fry score) lighter than 6 with low flesh disorders. The five selections were Atlantic, 99-7-3, 99-37-8, 99-51-11 and 99-62-3. These are shown in bold in Table 5.6.3.

Selections for replicated screening.

Selections for further testing from both summer and winter unreplicated screenings are shown in Table 5.6.4.

5.6.4. Experiment 02AL36 – October 2002 planted replicated screening at Margaret River.

Background

This screening combined breeding lines selected for the crisp, French-fry, fresh and export markets.

Aims

1. To bulk seed of the lines selected in the previous screenings.
2. To apply further selection pressure to reduce the number to be tested in district trials. The additional selection pressure can only be applied to summer selections. Entries which have been selected for their winter performance will be tested in district trials without regard for their performance in this summer screening.

Results

Yield and quality data are shown in Table 5.6.4. Of the 67 entries 37 were categorised as crisp types. Selections had suitable tuber characteristics with yield, specific gravity and fry colour all not significantly less than Atlantic. This meant yield was greater than 48.6 t/ha, specific gravity was over 1.070 and fry colour was less than 5.8. Internal disorders could not be not significantly greater than Atlantic (i.e.<28%). Selections were Atlantic and 97-107-7.

Winter selections

Winter performance must be considered when selecting material for district trials. Addition selections from the winter screening (see previous section) which will also be tested in district trials were Atlantic, 99-7-3, 99-37-8, 99-51-11 and 99-62-3.

5.6.5 Selections for district trials

Selections for the district trial stage of testing were 97-107-7, 99-7-3, 99-37-8, 9-51-11 and 99-62-3. The district trials will be planted in a subsequent project.

Table 5.6.3 Quality and yield of crisp potato breeding lines in a May 2002 planted unreplicated screening at Baldivis. Selections shown in bold.

Entry	Tuber* characteristics	SG	Yield >80g (t/ha)	Cooking tests			Flesh faults (%)	Final selection & notes
				Crisp# colour	Boil+			
					ACD	Slough		
Selection criterion	yes	>1.075	-	<6	-	-		
Atlantic	**yes**	**1.085**	**47**	**4**	**1**	**3**	**0**	**Yes, standard**
Driver	yes	1.060	55	6	2	1	0	No, low SG, dk fry
99-1-7	?	1.069	14	6	1	2	0	No, ? TC, low SG, dk fry
99-5-1	?	1.067	15	4	1	2	0	No, ? TC & low SG
99-5-10	yes	1.066	14	5	1	1	0	No, low SG
99-7-3	**yes**	**1.082**	**7**	**3**	**1**	**1**	**0**	**Yes**
99-18-2	?	1.068	28	7	1	1	0	No, ? TC, low SG, dk fry
99-19-32	yes	1.067	33	7	1	1	0	No, low SG, dk fry
99-22-8	yes	1.064	29	7	2	1	0	No, low SG, dk fry
99-23-11	yes	1.074	28	4	1	2	0	No, low SG
99-37-8	**yes**	**1.078**	**14**	**3**	**1**	**4**	**0**	**Yes**
99-42-13	yes	1.069	24	4	1	2	0	No, low SG
99-50-16	?	1.083	18	5	2	2	0	No, ? TC
99-51-11	**yes**	**1.085**	**12**	**5**	**1**	**4**	**0**	**Yes**
99-58-24	yes	1.070	18	6	2	2	0	No, low SG, dk fry
99-58-25	yes	1.062	41	3	2	2	20	No, low SG
99-62-3	**yes**	**1.081**	**27**	**4**	**2**	**4**	**0**	**Yes**
99-63-7	yes	1.076	15	7	1	2	0	No, dk fry
99-64-10	yes	1.070	55	3	3	3	0	No, low SG
99-72-1	yes	1.069	15	5	3	3	0	No, low SG
99-72-4	?	1.073	13	3	2	4	0	No, ? TC, low SG
99-72-7	yes	1.092	23	6	4	4	0	No, dk fry
99-81-6	yes	1.069	10	7	1	2	0	No, low SG, dk fry

*Tuber characteristics; Yes = suitable, ? = questionable, no = unsuitable

#Crisp colour: 1-10, >7 too dark

+Boiling: ACD (after cooking darkening): 1 = nil, 3 = moderate, 5=general blackening
Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy

Table 5.6.4. Yield and quality of crisp entries in an October 2002 planted replicated screening at Margaret River.

Planted: 25 October 2002 Harvested: 4 March 2003 Soil type: sandy loam
Row spacing: 75 cm Soil temp. at harvest: 16°C Elevation: 100 m

Entry, tuber* characteristics and spacing (cm)		Yield (t/ha) Chats 0-70g	Small 70-120g	Medium 120-350g	Large 350-450g	Grade No. 1 70-450g	Oversize >450g	Rank by Grade No.1	Tuber no. per plant	Quality SG	Fry# colour	Flesh† faults
Selections criteria												
Suitable						>48.6				>1.070	<5.8	<28%
Atlantic	15	9.0	34.8	27.8	0.0	62.6	0.0	1	8.4	1.077	4.0	0
97-101-7	24	7.4	26.1	25.1	0.0	51.2	0.0	4	11.6	1.075	3.5	0
99-5-10	30	8.4	16.6	15.5	0.0	32.2	0.0	28	13.1	1.073	5.0	10
99-11-5	24	14.2	20.2	15.9	0.0	36.2	0.0	19	11.6	1.079	4.5	0
99-11-8	24	27.7	22.1	4.8	0.0	27.0	0.0	33	16.9	1.083	4.0	0
99-14-10	30	16.8	25.3	11.6	0.0	36.9	0.0	18	16.6	1.082	2.5	0
99-18-2	24	14.4	30.0	11.4	0.0	41.4	0.0	12	14.0	1.070	4.5	0
99-18-6	24	17.0	32.7	6.7	0.0	39.4	0.0	15	14.4	1.078	5.5	0
99-21-2	24	8.7	27.6	16.1	0.0	43.6	0.0	11	11.6	1.073	5.0	0
99-23-3	20	16.2	28.5	17.6	0.0	46.1	0.0	8	13.0	1.080	5.5	0
99-23-5	24	11.6	21.4	16.3	0.0	37.7	0.0	17	12.1	1.090	5.5	0
99-23-11	24	11.6	26.3	19.7	0.0	46.0	0.0	10	11.1	1.079	5.5	0
99-24-3	30	22.0	25.9	7.0	0.0	32.9	0.0	26	18.7	1.077	6.0	0
99-28-12	20	7.1	20.4	30.4	0.0	50.8	0.0	5	9.4	1.072	4.5	0
99-35-14	30	19.1	22.3	3.8	0.0	26.0	0.0	34	15.7	1.085	4.0	0
99-35-22	30	12.3	21.3	12.5	0.0	33.8	0.0	23	14.3	1.072	3.5	0
99-37-7	24	23.0	24.1	5.7	0.0	29.8	0.0	30	15.4	1.074	4.0	0
99-37-8	24	24.3	33.8	7.2	0.0	41.0	0.0	13	17.7	1.076	4.0	0
99-37-16	30	20.0	29.0	10.8	0.0	39.8	0.0	14	18.6	1.072	4.0	0
99-42-13	24	27.5	25.9	5.5	0.0	31.4	0.0	29	18.2	1.076	3.5	0
99-46-21	24	23.6	20.6	5.0	0.0	25.5	0.0	35	14.7	1.080	3.5	0
99-50-16	24	5.5	13.4	20.0	0.0	33.4	0.0	24	9.2	1.089	4.0	20
99-50-27	24	13.5	25.8	12.1	0.0	37.9	0.0	16	12.7	1.084	4.5	20
99-51-2	20	6.4	19.6	42.5	0.0	62.1	0.0	2	11.0	1.073	6.0	0
99-51-11	30	15.5	11.5	6.8	0.0	18.3	0.0	37	12.7	1.078	5.0	0
99-58-22	24	25.9	23.3	4.5	0.0	27.8	0.0	32	15.3	1.078	4.0	0
99-62-3	30	7.3	13.1	10.0	0.0	23.1	0.0	36	9.7	1.084	4.0	0
99-63-6	24	16.4	34.5	11.6	0.0	46.1	0.0	9	15.3	1.079	3.0	0
99-64-10	24	19.1	19.3	15.1	0.0	34.4	0.0	21	14.0	1.073	4.0	0
99-66-9	24	6.0	27.2	28.4	0.0	55.6	0.0	3	11.8	1.072	5.5	10
99-72-4	24	8.7	19.9	28.1	0.0	48.0	0.0	7	11.0	1.076	4.5	30†
99-72-7	24	14.1	24.3	11.8	0.0	36.1	0.0	20	12.5	1.088	4.5	0
99-78-6	30	17.4	27.5	6.7	0.0	34.2	0.0	22	17.4	1.083	3.5	0
99-78-9	36	17.0	18.3	9.9	0.0	28.2	0.0	31	17.1	1.085	4.5	0
99-78-52	24	25.0	27.1	5.5	0.0	32.6	0.0	27	15.7	1.083	4.0	0
99-79-13	24	13.4	19.5	13.6	0.0	33.2	0.0	25	11.2	1.065	3.5	40†
99-79-17	24	18.0	30.5	17.6	0.0	48.1	0.0	6	14.6	1.088	3.5	0
Significance+		***	***	***		***			***	***	*	
LSD P = 0.05		6.6	9.3	8.9		10.5			2.6	0.007	1.8	
LSD P = 0.01						14.0						

* Tuber characteristics: **bold** typeface = suitable, plain type = questionable, *italic* = unsuitable.
# Samples assessed visually: 1 - 10, 6 = borderline, >6 = too dark.
† Flesh faults: indicates significantly different from Atlantic.
+ "skew" indicates data did not fulfil assumptions of analysis of variance.

5.7 Sixteenth or "00" series of crisp experiments

5.7.1. Background

Breeding lines of the "00" series from the Department of Primary Industries, Victoria, Agriculture division's Potato Breeding Program were tested. One unreplicated screening was completed.

5.7.2. Experiment 02AL34 – November 2002 planted unreplicated screening at Margaret River.

Aims

1. To select entries suitable for crisp processing from the"00" series of Australian breeding lines. Plus two breeding lines from the "99" series of breeding lines. These were compared with the standard crisp variety Atlantic.
2. To provide high quality seed for further tests.

Results

Selections from NPIC

259 selections were sent to WA. 86 were categorised as crisps. 68 were selected for screening in WA. 18 were rejected due to unsuitable cooking quality (low SG (< 1.075) or dark fry colour).

Screening in WA

Fifty-eight entries were classified as crisp types at harvest in WA (Table 5.7.2). Selections had suitable tuber characteristics with specific gravity greater than 1.080 with fry colour lighter than 5. The five selections for further testing in next season's replicated screening are shown in bold typeface in Table 5.7.2.

Table 5.7.2. Tuber characteristics, yield and quality of crisp potato breeding lines in a November 2002 planted unreplicated screening at Margaret River. Selections in **bold** typeface.

Entry	Tuber* charact-eristics	SG	Yield >80g (t/ha)	Cook tests (NPIC 2002)			Final selection & notes
				Crisp# colour	Boil+ ACD	Boil+ Slough	
Selection criteria	yes	>1.080		<5			
Atlantic	**yes**	**1.081**	**36**	**-**	**-**	**-**	**yes**
99-27-25	?	1.063	9	-	-	-	no
99-64-5	yes	1.061	18	-	-	-	no
00-1-3	yes	1.075	22	4	1	3	no
00-1-5	yes	1.071	38	5	1	1	no
00-1-7	no	-	-	-	-	-	no
00-2-3	yes	1.078	18	2	1	3	no
00-2-4	yes	1.073	33	6	1	2	no
00-2-9	yes	1.077	22	6	2	3	no
00-3-1	yes	1.069	24	5	1	2	no

*Tuber characteristics (tc); yes = suitable, ? = questionable, no = unsuitable

Crisp colour; scale 1 - 10 (light to dark), >6 unacceptable for crisps.

+Boiling: ACD (after cooking darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy

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Table 5.7.2. continued. Tuber characteristics, yield and quality of crisp potato breeding lines in a November 2002 planted unreplicated screening at Margaret River. Selections in **bold** typeface.

Entry	Tuber* charact-eristics	SG	Yield >80g (t/ha)	Cook tests (NPIC 2002)			Final selection & notes
				Crisp#	Boil+		
				colour	ACD	Slough	
Selection criteria	yes	>1.080		<5			
00-3-3	?	1.074	34	4	2	4	no
00-3-4	?	1.071	13	6	2	2	no
00-7-2	yes	1.079	16	3	2	1	no
00-8-18	yes	1.067	34	6	1	1	no
00-8-25	yes	1.074	39	5	1	3	no
00-15-1	no	-	-	-	-	-	no
00-15-2	yes	1.078	31	2	1	3	no
00-15-3	no	-	-	-	-	-	no
00-15-4	yes	1.072	21	5	1	2	no
00-15-6	yes	1.074	19	5	1	3	no
00-15-15	yes	1.075	53	6	1	1	no
00-15-17	yes	1.075	25	6	1	3	no
00-15-18	**yes**	**1.084**	**25**	**3**	**1**	**3**	**yes**
00-15-26	no	-	-	-	-	-	no
00-15-30	**yes**	**1.088**	**17**	**4**	**2**	**3**	**yes**
00-15-31	?	1.079	41	4	1	3	no
00-15-33	yes	1.085	30	5	1	2	no
00-15-38	yes	1.075	30	5	1	3	no
00-15-40	**yes**	**1.092**	**26**	**3**	**1**	**3**	**yes**
00-15-42	yes	1.076	33	5	1	3	no
00-15-67	**yes**	**1.081**	**45**	**3**	**1**	**3**	**yes**
00-15-68	yes	1.090	18	6	1	3	no
00-15-69	yes	1.073	21	5	1	2	no
00-15-71	yes	1.075	35	5	1	2	no
00-15-73	?	1.071	28	2	1	2	no
00-15-79	yes	1.080	16	5	2	3	no
00-15-80	yes	1.082	27	5	2	3	no
00-16-10	yes	1.095	26	6	1	2	no
00-16-17	**yes**	**1.081**	**36**	**-**	**-**	**-**	**yes**
00-17-3	yes	1.077	18	3	1	2	no
00-20-34	yes	1.074	31	6	1	2	no
00-24-5	yes	1.077	30	4	4	1	no
00-24-6	no	-	-	-	-	-	no
00-24-8	no	-	-	-	-	-	no
00-24-19	yes	1.073	35	6	1	1	no
00-25-9	yes	1.086	33	5	3	1	no
00-38-1	yes	1.065	37	3	2	2	no
00-38-3	no	-	-	-	-	-	no
00-38-5	no	-	-	-	-	-	no
00-39-10	no	-	-	-	-	-	no
00-39-21	yes	1.077	22	5	2	1	no
00-54-1	yes	1.066	33	7	1	2	no
00-54-3	no	-	-	-	-	-	no
00-69-8	yes	1.066	21	-	-	-	no
00-83-1	no	-	-	-	-	-	no
00-83-2	no	-	-	-	-	-	no
00-83-5	no	1.078	35	3	1	2	no
00-85-5	no	-	-	-	-	-	no
00-87-3	yes	1.095	43	5	2	3	no

*,#,+ See legend below table on previous page.

6. Crisp Discussion

6.1 Summary

In this project one breeding line, 90-2-6 (Bliss), had its benefits to industry confirmed. Another breeding line previously selected, 91-106-1 (Sonic) was shown to be prone to internal disorders and was de-selected (Section 5.2.2). A discussion on the benefits and disadvantages of 90-2-6 (Bliss) follows.

6.2 90-2-6 (Bliss)

Parents

90-2-6 was bred at the Department of Primary Industries, Victoria, Agriculture division's the National Potato Improvement Centre by Dr Roger Kirkham. Its parents were Atlantic and Lindsay.

Summary of Performance

90-2-6 (Bliss) was tested in the sixth and seventh series of experiments by Dawson & Mortimore (2000). There have been twelve additional experiments with 90-2-6 (Bliss) completed in this project. Averages for different planting times from all experiments done in WA are given in Table 6.2.

October November plantings.

Table 6.2 presents averages of eight experiments. 90-2-6 (Bliss) had higher average yield than Atlantic (56 t/ha versus 45 t/ha), higher average specific gravity (1.090 versus 1.077), similar fry colour (both 3.3) and only a fraction of the internal disorders of Atlantic (3% versus 16%). 90-2-6 (Bliss) was planted at a lower density than Atlantic, 20 cm between plants compared with 15 cm for Atlantic, and this indicates reduced seed costs are possible. 90-2-6 (Bliss) had a two week longer maturity than Atlantic (Dawson & Mortimore 2000). 90-26 (Bliss) had reduced bruise levels from an October planting as assessed by a processing company (Dawson & Mortimore 2000). Dawson and Mortimore (2000) also reported that cadmium levels in 90-2-6 (Bliss) were significantly higher than for Atlantic but were not above the MPC. An additional test for cadmium showed that 90-26 (Bliss) had lower levels than Atlantic though the difference was not significant (See Table 5.3.4).

Double-crop plantings.

Table 6.2 presents averages from seven trials. In the June/August planting period 90-2-6 (Bliss) produced a higher yield than Atlantic (50 t/ha versus 44 t/ha). Specific gravity was higher too: 1.094 versus 1.090. Fry colour of 4.1 was acceptable though darker than Atlantic's 3.1. Maturity was two weeks longer than Atlantic (Dawson & Mortimore 2000) while internal disorders were less (4% versus 19%). In the February/March planting period 90-2-6 (Bliss) had similar yield to Atlantic, higher specific gravity (1.082 versus 1.077) and similar fry colour. 90-2-6 (Bliss) again had lower flesh faults than Atlantic (9% versus 30%). Dawson & Mortimore (2000) also report that 90-2-6 (Bliss) had reduced bruise levels from a March planting as assessed by the ball bearing method.

April/May plantings.
Table 6.2 presents averages from three experiments. 90-2-6 (Bliss) had similar yield to Atlantic (each 35 t/ha), higher average specific gravity (1.092 versus 1.083), darker though acceptable fry colour fry colour (4.9 versus 3.7) and less internal disorders than Atlantic (1% versus 23%). Disease screenings showed that 90-2-6 (Bliss) was susceptible to powdery scab while Atlantic was tolerant (Table 9.4.12.1).

Benefits compared with Atlantic.

- much higher specific gravity,
- higher yield in July/August and October/November plantings,
- reduced internal disorders,
- reduced bruising,
- reduced planting density.

Disadvantages compared with Atlantic

- longer maturity,
- more susceptible to powdery scab.

Conclusion

90-2-6 deserves to be tested on a commercial scale in summer grown crops as well as in the double cropping system of the Swan Coastal Plain.

Table 6.2. Averages of yield and quality measurements of all experiments of 90-2-6 (Bliss) completed in WA. Many results taken from Dawson & Mortimore (2000).

Entry	Crisp* Grade (t/ha) 50/70-430/450g	Tuber no. per plant	Quality			
			SG	Fry# colour	Flesh faults (%)	Cd@ (mg/kg f.wt)
April/May plantings, n = 3.						
Atlantic	35.2	4.4	1.083	3.7	23	
90-2-6 (Bliss)	34.8	6.8	1.092	4.9	1	
June/August planting, n = 7						
Atlantic	43.8	6.2	1.090	3.1	19	
90-2-6 (Bliss)	49.9	7.0	1.094	4.1	4	
February/March plantings, n = 7						
Atlantic	47.5	5.0	1.077	4.3	30	
90-2-6 (Bliss)	48.0	6.2	1.082	4.4	9	
October/November plantings, n = 8						(n=2)
Atlantic	44.6	6.4	1.077	3.3	16	0.053
90-2-6 (Bliss)	55.5	7.6	1.090	3.3	3	0.067

*Note that grades varied slightly due to some experiments containing more than one market type.
Samples assessed visually: 1 - 10, 7 = borderline for French fries, >7 = too dark.
@ Cd = cadmium - maximum permitted concentration = 0.1 mg/kg fresh weight.

6.3 Outcomes achieved compared with initial objectives

Varieties were sought which improved upon the standard variety Atlantic. New varieties that set more tubers, had greater yield with fewer internal disorders, with similar cooking quality to Atlantic were required. The breeding line, 90-2-6 (Bliss), selected in this project ,delivered the following results, it had:

- much higher specific gravity than Atlantic,
- higher yield in July/August and October/November plantings than Atlantic,
- reduced internal disorders compared with Atlantic,
- reduced bruising, and
- requires reduced, or less expensive, planting density.

This indicates that the outcomes of the project have lived up to the initial expectations.

7 French-fry results

7.2 Background

35,000 tonnes of French-fry potatoes were grown in WA for Simplot until 1999 when the Manjimup factory closed. With large scale French-fry processing ceasing it was decided that French-fry variety evaluation work should be reduced. The priority was to complete testing of breeding lines in our possession. Therefore the tenth series of experiments was the last "full-scale" series of French-fry evaluation experiments. Breeding lines that had been selected from the eleventh and twelfth series had their assessment accelerated by promoting them into the demonstrations of the tenth series of experiments. From the thirteenth series on, French-fry testing was re-started. We decided to evaluate only those French-fry varieties that could also be used for the fresh market. This meant varieties required both cooking quality and appearance acceptable for both fresh market and French-fry processors.

7.2 Tenth or "94" series of French-fry experiments (with 11th & 12th series)

7.2.1 Background

Two demonstrations were completed of the tenth series of experiments which commenced in 1996. Breeding lines of the "94" series from the Department of Primary Industries, Victoria, Agriculture division's Potato Breeding Program were tested. The previous activities, three screenings, two district trials and two demonstrations were reported by Dawson & Mortimore (2000). Entries from district trials of the eleventh series of experiments plus those from the replicated screening of the twelfth series of experiments were promoted to the two demonstrations reported here.

7.2.2. Experiment 00MA9 - November 2000 planted demonstration at Pemberton.

Aims

1. To select entries from the 10th, 11th and 12th series of experiments for their suitability for main-crop French-fry production.
2. To demonstrate new varieties to growers and industry representatives.

Results

Yield and quality data are shown in Table 7.2.2. Yield was low probably due to inadequate fertiliser application. Russet Burbank matured early at only 15 weeks and produced just 35 t/ha. Other entries matured from 16 - 19 weeks. Selections had suitable tuber characteristics, specific gravity greater than 1.070, acceptable cooking quality and no major faults. Entries meeting these criteria were: 88-31-5 (Donnelly), 89-27-33 (MacRusset), 92-37-1 (Barman), 94-42-10, 94-47-19 and 96-136-4.

Table 7.2.2. Yield and quality of French-fry entries in a November 2000 planted demonstration at Pemberton.

Planted: 17 November 2000 | Harvested: 11 April 2001 | Soil temperature at harvest: 16°C
Row spacing: 75 cm | Soil type: clay loam | Elevation: 120 m

Entry & tuber* characteristics	Spacing in rows (cm)	Yield (t/ha)					Rank by Fry grade	Tuber		Quality						
		Chats	Small	Large	Over size	Fry grade		No per plant	Av mkt wt (g)	SG	Fry colour score#			Cd@ (% of RB	Bruise score §	Flesh† faults (%)
		0-100g	100-280g	280450g	>450g	>100g					Colour	SED	ACD			
Russet Burbank	38	7.8	25.7	5.8	0.0	31.5	9	10.2	146	1.073	0	1	1.5	100	0.3	0
Russet Burbank (Grower's seed)	38	7.6	28.2	7.0	0.0	35.2	5	9.9	162	1.071	3	3	1.5	-	0.1	0
A8495-1	30	9.6	17.1	7.5	0.0	24.6	13	7.7	172	1.064	7	0	1.5	-	0.3	8†
88-31-5 (Donnelly)	20	2.1	30.3	13.8	0.0	44.1	1	3.8	215	1.076	3	4	2.0	104	1.9	8†
89-19-2 (Sleeping Beauty)	30	3.4	19.5	10.6	0.4	30.6	10	5.5	208	1.078	3	2	2.5	111	0.4	0
89-27-33 (MacRusset)	30	6.8	25.7	7.4	0.0	33.1	8	7.1	169	1.073	1	0	3.0	80	0.4	0
92-37-1 (Barman)	25	8.1	25.4	8.2	0.7	34.4	6	6.5	177	1.074	3	3	2.0	88	0.2	0
94-42-10	25	4.1	24.9	16.6	0.2	41.7	2	5.6	210	1.081	2	0	2.5	122	0.2	14†
94-47-19	30	1.6	19.2	18.6	1.4	39.2	3	4.6	243	1.070	0	0	1.5	74	0.2	2
94-128-15	25	3.3	27.5	9.5	0.0	37.1	4	4.9	192	1.066	1	0	1.5	163	1.2	0
95-96-1	30	4.4	15.1	9.4	0.2	24.8	12	4.3	193	1.077	4	7	2.5	-	0.9	4
96-136-4	30	2.3	19.6	10.7	2.8	33.1	7	4.8	225	1.077	3	7	2.0	51	1.4	0
96-141-17	30	4.0	19.0	8.3	0.9	28.3	11	5.1	192	1.092	4	2	2.5	-	2.0	68†

* Tuber characteristics: **bold** face = suitable, plain = questionable, *italic* = unsuitable.
# Samples assessed visually: Fry colour: 1 - 7, > 4 unacceptable
SED = stem end darkening. scale 0-20, 0 = absent, 20 = severe
ACD = after cooking darkening. scale 0-20, 0 = absent, 20 = severe
@ Cadmium data from various replicated trials. % of Russet Burbank value shown except for 96-136-4 which is compared with Delaware.
§ Bruise tested with ball bearing. The lower the score the better. Score is average of 4 sites from each of 5 tubers.
† Flesh faults: † indicates significantly different from standard variety.

Experiment 01MA33 - November 2001 planted demonstration at Pemberton.

Aims

1. To select entries from the 10th, 11th and 12th series of experiments for their suitability for main-crop French-fry production.
2. To demonstrate new varieties to growers and industry representatives.

Results

Yield and quality data are shown in Table 7.2.3. Quality assessments were done by the Department of Agriculture and two processors, WA Chip Company and Vital Foods (Table7.2.3). Note that all three specific gravity assessments varied considerably. The procedures used by all assessors should be examined to eradicate the variation.

Department of Agriculture selections

Selections had to have high yield, specific gravity equal to or higher than Russet Burbank and good cooking quality with no major defects. Yields were highest for 92-37-1 (Barman), 96-136-4 (Crusher), 88-31-5 (Donnelly), 89-12-1 (Eureka) and 94-42-10 with a range of 63 to 68 t/ha compared to 53 t/ha produced by Russet Burbank. These high-yielding varieties all had equal or higher specific gravity than Russet Burbank. 94-42-10 had 16% of tubers affected by fleck. 96-136-4 (Crusher) had after cooking darkening (ACD), or greying, of the French-fries after frying although levels were considered to be acceptable. 92-37-1 (Barman) had the lowest tuber weight of the selections and it should be spaced further apart in future tests. Of the other varieties that didn't have higher yield than Russet Burbank, 89-19-2 (Sleeping Beauty) was the best as it had good quality and large tubers.

WA Chip selections

Improvements in quality over Russet Burbank were found in 96-136-4 (Crusher), 89-27-6 (My Fry) and 94-42-10; equal to Russet Burbank were 92-37-1 (Barman), 88-31-5 (Donnelly) and 89-27-33 (MacRusset).

Vital Foods selections

89-19-2 (Sleeping Beauty) was best: 96-136-4 (Crusher) was unacceptable due to after cooking darkening.

Grower's selections based on inspection at harvest

Growers were asked to vote for varieties at the field day. The top three were 96-136-4 (Crusher), 89-27-6 (My Fry) and 94-42-10.

7.2.4. Selections from demonstrations of the tenth series

After discussions with WA Chip Company the following breeding lines were selected for further, commercial scale testing: 92-37-1 (Barman), 89-27-33 (MacRusset), 89-19-2 (Sleeping Beauty), 94-42-10. Two other breeding lines should be kept for testing for winter production for when the processor requires out-of-season potatoes. These were 89-27-6 (My Fry) and 96-141-12 (Windsor). 96-141-12 (Windsor) was selected in the twelfth series of fresh market trials (See Section 9.3.6).

Table 7.2.3. Yield and quality of French-fry entries in a November 2001 planted demonstration at Pemberton.

Planted: 29 November 2001, Harvested: 2 May 2002, soil temp. at harvest: 16°C, soil type: gravel loam, elevation: 120 m, row spacing: 75 cm

Entry & tuber* characteristics	Spac-ing in rows (cm)	Yield (t/ha)					Rank by Fry grade	Tuber		Quality								
		Chats	Small	Large	Over size	Fry grade		No per plant	Av mkt wt (g)	SG			French-fry#			Flesh† faults	Ratings	
		0-100g	100-280g	280-450g	>450g	>100g				Dept Ag	WA Chip	Vital Foods	Color	SED	ACD	(%)	WA Chip	Vital Foods
Kestrel	25	6.2	37.4	16.2	1.1	54.7	8	7.4	185	1.069	1.077	-	0	3	2.5	24	4	-
Russet Burbank	38	5.3	34.6	18.0	0.3	52.9	10	10.5	183	1.075	1.083	-	0	0	3.0	0	2	-
R Burbank (grower's seed)	38	4.2	27.7	21.1	2.1	51.0	11	7.7	249	1.077	1.083	-	0	1	2.5	0	2	-
88-31-5 (Donnelly)	20	1.8	17.9	29.5	16.3	63.8	4	3.8	299	1.081	1.084	-	0	1	3.0	0	2	-
89-12-1 (Eureka)	25	6.4	40.2	21.5	1.5	63.2	5	8.0	208	1.075	1.089	-	0	3	3.0	0	3	-
89-19-2 (Sleeping Beauty)	30	2.4	20.1	27.7	5.9	53.7	9	5.7	257	1.079	1.088	1.080	0	2	3.0	0	3	1
89-27-6 (My Fry)	25	4.1	24.2	24.5	7.3	56.0	6	5.9	238	1.090	1.093	1.086	0	0	3.5	18	1	2
89-27-33 (MacRusset)	30	6.1	27.5	23.1	5.2	55.8	7	8.8	209	1.076	1.085	-	0	0	3.0	0	2	-
92-37-1 (Barman)	25	6.4	43.7	20.3	1.4	65.3	2	8.4	194	1.077	1.080	1.081	0	6	3.0	0	2	3
94-42-10	25	3.1	20.2	34.8	9.7	64.6	3	5.6	266	1.082	1.090	-	0	3	3.5	16	4	-
94-47-19	30	2.8	19.3	26.2	4.0	49.5	12	5.6	246	1.080	1.080	-	0	0	2.5	0	1	-
96-136-4 (Crusher)	30	3.5	16.7	34.0	16.9	67.6	1	7.1	291	1.081	1.086	1.086	0	14	3.0	0	1	4

* Tuber characteristics: **bold** face = suitable, plain = questionable, *italic* = unsuitable.

# Samples assessed visually: Fry colour: 1 - 7, > 4 unacceptable
SED = stem end darkening. scale 0-20, 0 = absent, 20 = severe
ACD = after cooking darkening. scale 0-20, 0 = absent, 20 = severe

† Flesh faults: † indicates significantly different from standard variety.

7.3 Thirteenth or "97" series of French-fry experiments

7.3.1 Background

Breeding lines of the "97" series from Agriculture Victoria's Potato Breeding Program were tested. Three screenings and one district trial were completed.

7.3.2. Experiment 99BU1F - October 1999 planted unreplicated screening at Margaret River.

Aims

1. To select entries suitable for the French-fry market in an October planting at Margaret River. The entries comprise 95 "97" series of Australian breeding lines plus 24 yellow fleshed varieties (breeding lines and imports), plus two white fleshed imported varieties and three other earlier series breeding lines selected at the NPIC. These were compared with the standard variety Russet Burbank.
2. To provide high quality seed for further tests.

Results

Thirteen entries were classified as French-fry types. To be selected entries had to have suitable or questionable tuber characteristics with specific gravity greater than 1.070. The sole selection was 97-83-11 (Table 7.3.2 – see bold typeface). This selection will be tested with fresh market varieties in a replicated screening next season.

Table 7.3.2. Quality and yield of French-fry potato breeding lines in an October 1999 planted unreplicated screening at Margaret River. Selections shown in bold.

Entry	Tuber* charact-eristics	SG	Yield >80g (t/ha)	Cooking tests (NPIC 1999)			Final selection & notes
				Crisp#	Boil+		
				colour	ACD	Slough	
Ranger Russet	?	1.076	65.9	-	-	-	No questionable tuber char's
Russet Burbank	**no**	**1.075**	**84.3**	6-7	1-2	2-3	**Yes main-crop standard**
Shepody	**?**	**1.062**	**53.6**	-	-	-	**No, early standard**
94-109-72	no	-	-	-	-	-	No unsuitable tuber char's
94-113-31	no	-	-	-	-	-	No unsuitable tuber char's
96-145-12	yes	1.059	58.0	-	-	-	No low SG
97-11-21	yes	1.064	38.4	7	1	3	No low SG
97-12-9	yes	1.062	30.9	6	1	2	No low SG
97-25-5	yes	1.058	9.5	6	2	3	No low SG
97-63-6	no	-	-	-	-	-	No unsuitable tuber char's
97-83-13	**yes**	**1.079**	**124.1**	**6**	**2**	**3**	**Yes**
97-9-1	?	1.079	26.3	5	2	3	No questionable tuber char's
97-91-11	no	-	-	-	-	-	No unsuitable tuber char's
97-98-5	no	-	-	-	-	-	No unsuitable tuber char's

*Tuber characteristics; Yes = suitable, ? = questionable, no = unsuitable
# Crisp colour: 1-10, >7 too dark for French-fries.
ST = standard variety, TC = tuber characteristics
+ Boiling: ACD (after cooking darkening): 1 = nil, 3 = moderate, 5=general blackening
Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy

7.3.3 Experiment 00PE1 - May 2000 planted unreplicated screening at Baldivis.

Aim

To select entries suitable for the French-fry market in a May planting at Baldivis, near Perth, from the 120 "97" series of breeding lines and imported varieties selected at the NPIC.

Selections

Eleven breeding lines and named varieties were classified as French-fry types (Table 7.3.3.). To be selected entries had to have suitable or questionable tuber characteristics with specific gravity greater than 1.075 and crisp colour less than 7. The selections should also be suitable for the fresh market and so sloughing and after cooking darkening should be less than 4. No entries met these criteria (Table 7.3.3). Two possible selections, 97-91-6 and 97-105-28, were rejected due to severe sloughing.

Further tests

French-fry selections from the summer and winter unreplicated screenings will bulked in the next replicated summer screening. Only the sole summer selection will have further selection pressure applied.

Table 7.3.3. Quality and yield of French-fry potato breeding lines in a May 2000 planted unreplicated screening at Baldivis. There were no selections.

Entry	Tuber* charact-eristics	SG	Yield >80g (t/ha)	Cooking tests			Flesh faults (%)	Final selection & notes
				Crisp# colour	Boil+ ACD	Boil+ Slough		
Maris Piper	yes	1.071	44	7	1	2	0	No, low SG & dark fry col.
Ranger Russet	no	1.068	28	8	1	2	0	No, unsuit. tub. char.
Russet Burbank	no	-	-	-	-	-	-	No, unsuit. tub. char.
Shepody	no	1.063	36	8	1	2	0	Standard
96-145-12	yes	1.077	34	7	1	4	0	No, dark fry colour.
97-38-3	yes	1.059	64	6	1	1	10	No, low SG.
97-86-53	no	-	-	-	-	-	-	No, unsuit. tub. char.
97-86-58	no	-	-	-	-	-	-	No, unsuit. tub. char.
97-91-6	yes	1.077	53	5	2	4	0	No, slough too great.
97-102-1	yes	1.067	60	6	2	4	0	No, low SG.
97-105-28	yes	1.080	53	6	1	4	10	No, slough too great.

*Tuber characteristics; Yes = suitable, ? = questionable, no = unsuitable
# Crisp colour: 1-10, >7 too dark for French-fries.
ST = standard variety, TC = tuber characteristics
+ Boiling: ACD (after cooking darkening): 1 = nil, 3 = moderate, 5=general blackening
Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy

7.3.4. Experiment 00BU2 – November 2000 planted replicated screening at Margaret River.

Background

This screening combined fresh market, crisp and French-fry entries. The two breeding lines shown in Table 7.3.4 do not appear in the previous summer unreplicated screening (Table 7.3.2). This is because 97-86-53 was selected as a crisp (Table 5.3.2) while 97-102-1 was selected as a fresh market variety (Table 9.4.2.1).

Aims

1. To bulk seed of the selections from previous screenings.
2. To apply further selection pressure to reduce the number to be tested in district trials. The additional selection pressure can only be applied to summer selections. Entries, which have been selected for winter performance, must be tested in district trials without additional summer selection.

Results

Yield and quality data are shown in Table 7.3.4. None of the French-fry entries had any internal disorders. Russet Burbank was mature after 19 weeks while Shepody was mature at 15 weeks. The other entries matured at 17 - 18 weeks. Selections had suitable tuber characteristics for French-fry and fresh markets with specific gravity greater than 1.075. Selections also had to have suitable cooking quality for the fresh market unless they had outstanding French-fry performance. The sole selection was 97-102-1.

Winter selections

Winter performance must be considered when selecting material for district trials. There were no selections from the winter screening (see previous section).

Table 7.3.4. Yield and quality of French-fry entries in a November 2000 planted replicated screening at Margaret River.

Planted: 3 November 2000 Harvested: 21 March 2001 Soil type: sandy loam
Row spacing: 76 cm Soil temp. at harvest: 16°C Elevation: 100 m

Entry, tuber* characteristics and spacing (cm)		Yield (t/ha)						Rank by Grade No.1	Tuber no. per plant	Quality			
		Chats 0-70g	Small 70-120g	Med-ium 120-350g	Large 350-450g	Grade No. 1 70-450g	Over size >450g			SG	ACD @	Slough ~	Fry# colour
Russet B'bank	36	5.0	16.4	45.9	0.4	62.6	0.0	14	15.2	1.081	1.5	2.0	6.5
Shepody	24	2.4	8.1	35.7	3.2	46.9	2.0	30	7.2	1.060	3.5	2.0	7.0
97-86-53	24	4.4	11.3	57.2	3.1	71.7	0.9	5	9.7	1.077	1.8	1.5	6.5
97-102-1	24	1.6	6.9	49.1	12.6	68.6	4.3	9	7.6	1.076	3.3	1.8	6.0
Significance+		***	***	***	skew	***	skew		***	***	***	**	***
LSD P = 0.05		2.9	6.2	15.6		14.8			2.1	0.006	1.5	1.0	1.8

***** Tuber characteristics: **bold** typeface = suitable, plain type = questionable, *italic* = unsuitable.
@ ACD (after cooking darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
~ Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy.
# Samples assessed visually: 1 - 10, 7 = borderline, >7 = too dark.
+ "skew" indicates data did not fulfil assumptions of analysis of variance.

7.3.5. Experiment 01MA11 - October 2001 planted district trial at Manjimup.

Aim

To select entries suited to French-fry production in an October planting. Attractive varieties that can also be used for the fresh market are required. The standard used was 89-12-1 (Eureka).

Results

The trial grew well with high rates of emergence except for Eureka (78% of plants emerged) and 97-102-1 (77%). Yield and quality data are shown in Table 7.3.5. Selections had suitable tuber characteristics for French-fry and fresh markets. Selections also had to have suitable cooking quality for both the French-fry and fresh markets unless they had outstanding French-fry performance. Therefore specific gravity had to be greater than 1.075 with fry colour less than 7 with ACD and slough less than 3. 92-27-2 and 97-102-1 had suitable tuber characteristics but both had moderate to severe ACD (Table 9.4.7). Therefore no selections were made.

Table 7.3.5. Yield and quality of French-fry entries in an October 2001 planted district trial at Manjimup.

Planted: 9 October 2001 Harvested: 20 February 2002 Soil type: sandy loam
Row spacing: 80 cm Soil temp. at harvest: 19°C Elevation: 200 m

Entry, tuber* characteristics and spacing in row (cm)		Yield (t/ha)						Rank by Grade No.1	Tuber no. per plant	Quality			
		Chats 0-70g	Small 70-120g	Med-ium 120-350g	Large 350-450g	Over size >450g	Fry Grade >120g			SG	Fry# colour	Flesh† faults (%)	Cd ¢ (mg/kg f wt)
Eureka	20	1.9	5.7	42.1	7.9	3.3	53.4	12	7.8	1.079	5.7	0	
92-27-2	30	1.7	7.0	34.8	2.0	2.2	39.0	25	7.5	1.081	5.0	0	
95-37-12	24	2.2	8.8	38.9	2.4	1.1	42.5	19	7.8	1.076	5.7	3	
97-102-1	24	0.9	3.4	31.1	8.5	7.2	46.9	27	6.3	1.084	6.0	0	
Significance+		***	***	***	skew	skew	***		***	***	***	ns	
LSD P = 0.05		1.4	4.5	9.0			9.1		1.3	0.004	1.6		

* Tuber characteristics: **bold** typeface = suitable, plain type = questionable, *italic* = unsuitable.
# Samples assessed visually: 1 - 10, 7 = borderline, >7 = too dark.
† indicates significantly different flesh disorders than the control
¢ Cd = cadmium - maximum permitted concentration = 0.1 mg/kg fresh weight.
+ "skew" indicates data did not fulfil assumptions of analysis of variance.

7.3.6. Selections from the thirteenth series of French-fry trials.

No selections were made.

7.4 Fourteenth or "98" series of French-fry experiments

7.4.1. Background

Breeding lines of the "98" series from the Department of Primary Industries, Victoria, Agriculture division's Potato Breeding Program were tested. Three screenings and one district trial was completed and are described below.

7.4.2. Experiment 00BU1 – November 2000 planted unreplicated screening at Margaret River.

Aims

1. To select entries suitable for the French-fry market in a November planting at Margaret River. The entries comprise 171 "98" series of Australian breeding lines plus three other earlier series breeding lines selected at the NPIC. Plus three "97" series entries from last year's screening. These were compared with the standard variety Russet Burbank.
2. To provide high quality seed for further tests.

Results

Nine entries were classified as French-fry types (Table 7.4.2). Selections had suitable or questionable tuber characteristics with specific gravity of 1.073 or greater and fry colour lighter than 7. No entry met these criteria. Only 93-3-15 met the tuber characteristics selection criteria but its specific gravity was too low.

Table 7.4.2. Tuber characteristics, yield and quality of crisp potato breeding lines in a November 2000 planted unreplicated screening at Margaret River. Selections in **bold** typeface.

Entry	Tuber* charact-eristics	SG	Yield >80g (t/ha)	Cook tests (NPIC 2000)			Final selection & notes
				Crisp# colour	Boil+		
					ACD	Slough	
Russet Burbank	?	1.079	29	6	3	2	Yes, standard
93-3-15	yes	1.064	80	-	-	-	No, low SG (ware selection)
98-4-5	no	-	-	-	-	-	No, U.S. tuber chars.
98-37-1	no	-	-	-	-	-	No, U.S. tuber chars.
98-37-22	no	-	-	-	-	-	No, U.S. tuber chars.
98-67-29	no	-	-	-	-	-	No, U.S. tuber chars.
98-88-4	no	-	-	-	-	-	No, U.S. tuber chars.
98-102-23	no	-	-	-	-	-	No, U.S. tuber chars.
98-107-11	no	-	-	-	-	-	No, U.S. tuber chars.

*Tuber characteristics (tc); yes = suitable, ? = questionable, no = unsuitable

Crisp colour; scale 1 - 10 (light to dark), >7 unacceptable for French-fries.

+Boiling: ACD (after cooking darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy

7.4.3. Experiment 01PE7 - May 2001 planted unreplicated screening at Baldivis.

Aims

To select entries suitable for the French-fry market in a May planting at Baldivis near Perth from the "98" series of breeding lines selected at the NPIC and other varieties described for Experiment 00BU1 (see previous section).

Results

Five entries were classified as fresh market types (Table 7.4.3). To be selected entries had to have suitable tuber characteristics with crisp colour (fry score) better than 8 and specific gravity greater than Shepody (1.064). The two selections were 89-12-1 (Eureka a.k.a. Riverina Russet) and 98-109-1. The latter was also selected in winter and summer for the fresh market (see Sections 9.5.3 and 9.5.4 respectively).

Table 7.4.3. Quality and yield of French-fry potato breeding lines in a May 2001 planted unreplicated screening at Baldivis. Selections shown in bold.

Entry	Tuber* charact-eristics	SG	Yield >80g (t/ha)	Cooking tests			Flesh faults (%)	Final selection & notes
				Crisp# colour	Boil+			
					ACD	Slough		
Eureka	yes	1.068	58.7	6	1	1	0	yes despite low SG
Shepody	no	1.064	46.7	8	1	2	0	no, tc, low SG & dark fry
93-3-15	no	-	-	-	-	-	-	no, tc
98-102-23	no	-	-	-	-	-	-	no, tc
98-109-1	yes	1.069	40.1	6	2	1	0	yes despite low SG

*Tuber characteristics; Yes = suitable, ? = questionable, no = unsuitable
#Crisp colour: 1-10, >7 too dark
+Boiling: ACD (after cooking darkening): 1 = nil, 3 = moderate, 5=general blackening
Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy

7.4.4. Experiment 01BU2 – November 2001 planted replicated screening at Margaret River.

Background

Western Australia only has a small French-fry processing industry. In March 2002 the MAES French-fry plant closed. We are searching for French-fry varieties that have a dual purpose and can be used for the fresh market. Therefore they require French-fry shape and quality with fresh market skin quality. This screening combined breeding lines selected for a crisp, French-fry, fresh and export markets. Many entries shown in Table 7.4.4 do not appear in the previous French-fry screenings results because they were selected from either the crisp or fresh market streams.

Aims

1. To bulk seed of the lines selected in the previous screenings.
2. To identify breeding lines with potential for French-fry and fresh market.

Results

Yield and quality data are shown in Table 7.4.4. Of the 53 breeding lines 9 were categorised as French-fry types. Selections had suitable tuber characteristics for both French-fry and fresh market, specific gravity of 1.075 or greater with fry colour less than 8 with internal disorders not significantly greater than Russet Burbank. The sole selection was 98-107-13.

Winter selections

Winter performance must be considered when selecting material for district trials. An additional selection from the winter screening (see previous section) which will also be tested in district trials is 98-109-1.

Selections for district trials

98-107-13 and 98-109-1 were the only selections for further testing as French-fries.

Table 7.4.4. Yield and quality of French-fry entries in a November 2001 planted replicated screening at Margaret River.

Planted: 1 November 2001 Harvested: 20 March 2002 Soil type: loam
Row spacing: 76 cm Soil temp. at harvest: 20°C Elevation: 100 m

Entry, tuber* characteristics and spacing (cm)		Yield (t/ha)						Rank by Grade No.1	Tuber no. per plant	Quality			
		Chats 0-70g	Small 70-200g	Med-ium 200-350g	Large 350-450g	Grade No. 1 70-450g	Over size >450g			SG	ACD @	Slough ~	Fry# colour
Russet Burbank	40	5.1	15.1	45.0	2.0	62.1	0.4	26	16.4	1.075	2.5	2.8	6.0
93-3-15	24	2.9	13.5	68.7	4.4	86.7	0.9	6	10.6	1.060	1.5	1.5	7.5
98-4-5	24	5.9	13.5	59.0	3.1	75.6	0.0	17	11.8	1.060	2.3	1.5	6.5
98-31-22	24	2.6	7.8	43.9	22.9	74.6	25.0	18	9.7	1.072	3.3	1.5	6.5
98-32-12	24	5.7	14.7	60.6	5.9	81.1	1.9	11	10.9	1.089	4.0	3.0	6.5
98-57-9	24	4.5	10.8	38.3	0.0	49.1	0.0	38	9.3	1.066	2.5	1.5	6.0
98-59-9	30	5.5	10.1	41.6	0.0	51.6	0.0	34	11.6	1.066	2.5	1.8	5.5
98-89-1	30	6.7	12.3	29.2	0.4	41.9	0.0	42	10.5	1.066	2.3	1.0	4.0
98-107-12	24	5.8	18.0	55.8	2.4	76.2	0.0	16	11.4	1.072	2.0	2.8	5.0
98-107-13	24	1.0	4.5	66.9	17.3	88.7	10.7	3	8.6	1.082	3.0	3.8	4.5
Significance+		skew	***	***	skew	***	skew		***	***	***	***	**
LSD P = 0.05			7.4	17.4		19.3			2.5	0.005	1.2	1.0	2.5
LSD P = 0.01						25.8							

* Tuber characteristics: **bold** typeface = suitable, plain type = questionable, *italic* = unsuitable.
@ ACD (after cooking darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
~ Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy.
# Samples assessed visually: 1 - 10, 7 = borderline, >7 = too dark.
+ "skew" indicates data did not fulfil assumptions of analysis of variance.

7.4.5 Experiment 02AL37MA – November 2002 planted district trial at Pemberton

Aims

To select entries for their suitability for multiple use as French-fries as well as for fresh market production. High yielding, oblong potatoes are needed that have processing quality as good as or better than Russet Burbank as well as suitable appearance for the fresh market.

Results

The trial grew well with high emergence rates. Yield and quality data are shown in Table 7.4.5. To be selected entries had to have suitable tuber characteristics for both the French-fry and fresh markets with specific gravity of 1.070 or higher (not significantly less than Russet Burbank). Yield could not be significantly less than Russet Burbank, fry colour could not be significantly darker than Russet Burbank and there could be no major faults. Selections were Eureka and 98-107-13. Cadmium concentration should not be significantly higher than Russet Burbank. Cadmium levels are yet to be tested.

Table 7.4.5. Yield and quality of French-fry entries in a November 2002 planted district trial at Pemberton.

Planted: 7 November 2002 Harvested: 20 March 2003 Soil type: Karri loam
Row spacing: 75 cm Soil temp. at harvest: 17°C Elevation: 200 m

Entry, tuber* characteristics and spacing (cm)		Yield (t/ha)						Rank by Grade No.1	Tuber no. per plant	Quality			
		Chats 0-70g	Small 70-200g	Med-ium 200-350g	Large 350-450g	Grade No. 1 70-450g	Over size >450g			SG	Fry# colour	Flesh faults †	ACD @
Selection criteria													
Suitable										≥1.070	<6.3		
89-12-1 (Eureka)	20	4.6	10.3	46.7	2.8	59.8	0.3	1	8.7	1.071	4.0	7	3.8
PO3	24	7.2	11.3	30.5	2.3	44.1	2.8	6	11.7	1.083	6.0	10	2.0
Russet Burbank	36	4.6	10.4	33.3	1.5	45.1	0.6	4	11.0	1.073	5.0	0	1.3
98-4-5	24	4.5	11.4	31.4	2.1	44.9	0.3	5	7.8	1.060	5.0	0	3.3
98-107-12	24	6.5	12.8	35.3	1.0	49.1	0.0	3	9.7	1.072	6.7	3	1.7
98-107-13	20	1.9	7.6	39.0	4.4	51.0	2.6	2	5.6	1.077	5.0	0	3.7
98-109-1	30	3.5	7.4	34.8	1.4	43.5	1.2	7	8.6	1.075	5.3	0	3.7
Significance+		ns	ns	ns	skew	ns	skew		*	***	*	ns	*
LSD P = 0.05									2.7	0.003	1.4		1.4

* Tuber characteristics: **bold** typeface = suitable, plain type = questionable, *italic* = unsuitable.
@ ACD (after cooking darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
# Samples assessed visually: 1 - 10, 7 = borderline, >7 = too dark.
† Flesh faults; † indicates significantly greater faults compared with Russet Burbank.
+ "skew" indicates data did not fulfil assumptions of analysis of variance.

7.5 Fifteenth or "99" series of French-fry experiments

7.5.1. Background

Breeding lines of the "99" series from the Department of Primary Industries, Victoria, Agriculture division's Potato Breeding Program were tested. Three screenings were completed.

7.5.2. Experiment 01BU1 – October 2001 planted unreplicated screening at Margaret River.

Aims

1. To select entries suitable for the French-fry market in an October planting at Margaret River. The entries comprise 174 "99" series of Australian breeding lines plus one other earlier series breeding line plus 18 imported varieties selected at the NPIC. Also four "98" series entries from last year's screening were re-planted. These were compared with the standard variety Russet Burbank.
2. To provide high quality seed for further tests.

Results

Selections from NPIC

280 breeding lines selected from the second year plots at the NPIC were sent to WA. 17 were selected for screening for French-fries in WA. 10 were not selected for screening as they had unsuitable cooking quality; their specific gravity was too low (<1.075) or their fry colour was >7. 55 were not selected for screening as they were solely for French-fry. With the closure of the Simplot factory we are concentrating on multipurpose varieties which must have suitable skin for the fresh market also.

At harvest nine entries were classified as French-fry types (Table 7.5.2). Selections had suitable tuber characteristics with specific gravity of 1.070 or greater. The three selections made were 99-9-7, 99-9-32 and 99-61-13.

Table 7.5.2. Tuber characteristics, yield and quality of French-fry potato breeding lines in a November 2001 planted unreplicated screening at Margaret River. Selections in bold typeface.

Entry	Tuber* charact-eristics	SG	Yield >80g (t/ha)	Cook tests (NPIC 2001)			Final selection & notes
				Crisp# colour	Boil+		
					ACD	Slough	
Selection criterion							
	yes	>1.070					
Shepody	no	1.071	65	-	-	-	No, TC
Russet Burbank	no	1.079	93	-	-	-	No, TC
99-3-4	no	-	-	-	-	-	No, TC
99-9-1	?	1.081	68	7	1	2	No, TC
99-9-7	**yes**	**1.089**	**75**	**-**	**6**	**2**	**Yes**
99-9-32	**yes**	**1.070**	**45**	**6**	**1**	**2**	**Yes**
99-61-7	yes	1.059	28	5	2	2	No, Low SG
99-61-13	**yes**	**1.080**	**49**	**5**	**1**	**2**	**Yes**
99-71-6	no	-	-	-	-	-	No, TC

*Tuber characteristics (tc); yes = suitable, ? = questionable, no = unsuitable

Crisp colour; scale 1 - 10 (light to dark), >7 unacceptable for French-fries.

+Boiling: ACD (after cooking darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy

7.5.3. Experiment 02AL35PE - May 2002 planted unreplicated screening at Baldivis.

Aims

To select entries suitable for the French-fry market in a May planting at Baldivis near Perth from the "99" series of breeding lines selected at the NPIC and other varieties described for Experiment 01BU1 (see previous section).

Results

Three entries were classified as French-fries (Table 7.5.3). To be selected entries had to have appearance equal to or better than Shepody with processing quality similar to Atlantic. So suitable tuber characteristics were required with crisp colour (fry score) better than 7 and specific gravity similar to Atlantic (1.085). No entries met these criteria.

Table 7.5.3. Quality and yield of French-fry potato breeding lines in a May 2002 planted unreplicated screening at Baldivis. Selections shown in bold.

Entry	Tuber* charact-eristics	SG	Yield >80g (t/ha)	Cooking tests			Flesh faults (%)	Final selection & notes
				Crisp# colour	Boil+			
					ACD	Slough		
Selection criteria								
	yes	>1.075		<8				
Atlantic	yes	1.085	47	4	1	3	0	Crisp standard
Shepody	yes	1.070	37	8	1	2	0	No, dk fry colour
99-67-28	yes	1.074	43	3	1	3	0	No
99-70-30	?	1.073	28	5	1	3	0	No, ? TC

*Tuber characteristics; Yes = suitable, ? = questionable, no = unsuitable
#Crisp colour: 1-10, >7 too dark
+Boiling: ACD (after cooking darkening): 1 = nil, 3 = moderate, 5=general blackening
Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy

7.5.4. Experiment 02AL36F - October 2002 planted replicated screening at Margaret River.

Background

Western Australia only has a small French-fry processing industry. In March 2002 the MAES French-fry plant closed. This factory has since been re-opened by the WA Chip Company. Proprietors require varieties that have flexibility. For example one that has small round tubers which could be used as crisps. We are also searching for French-fry varieties that have a dual purpose and can be used for the fresh market. Therefore they require French-fry shape and quality but with fresh market skin quality. This screening combined breeding lines selected for a crisp, French-fry, fresh and export markets.

Aims

1. To bulk seed of the lines selected in the previous screenings.
2. To identify breeding lines with potential for French-fry and other markets.

Results

Yield and quality data are shown in Table 7.5.4. Of the 53 breeding lines 6 were categorised as French-fry types. Selections had suitable tuber characteristics for both French-fry and fresh market, yield over 28.5 (not highly significantly less than Russet Burbank), specific gravity of 1.076 or greater with fry colour less than 7 with internal disorders not significantly greater than Russet Burbank. No entries met these criteria.

Winter selections

There were no selections from the winter screening (see previous section) to add to material to be tested further.

Table 7.5.4. Yield and quality of French-fry entries in an October 2002 planted replicated screening at Margaret River.

Planted: 25 October 2002 Harvested: 4 March 2003 Soil type: sandy loam
Row spacing: 75 cm Soil temp. at harvest: 16°C Elevation: 100 m

Entry, tuber* characteristics and spacing (cm)		Yield (t/ha)						Rank by Grade No.1	Tuber		Quality		
		Chats 0-70g	Small 70-120g	Medium 120-350g	Large 350-450g	Grade No. 1 70-450g	Oversize >450g		no. per plant	av mkt wt (g)	SG	Fry# colour	Flesh† faults
Selection criteria													
Suitable							>28.5			>135	>1.076	<7	
Delaware	20	14.3	32.6	23.4	0.0	56.0	0.0	1	12.5	105	1.066	7.5	10
Eureka	20	2.4	5.9	21.1	0.0	27.0	0.0	6	9.3	140	1.076	5.0	0
Russet Burbank	40	8.6	19.0	21.0	0.0	40.0	0.0	4	16.8	113	1.081	6.0	0
99-9-1	30	4.2	16.5	23.1	0.0	39.6	0.0	5	10.0	117	1.075	6.5	40
99-9-32	24	4.8	23.3	31.2	0.0	54.5	0.0	2	10.5	122	1.081	5.0	0
99-67-28	24	7.4	23.5	30.1	0.0	53.6	0.0	3	11.7	116	1.089	5.0	0
Significance+		***	***	***	skew	***	ns		***	***	***	***	ns
LSD P = 0.05		4.7	6.2	11.7		11.5			2.5	22	0.005	2.1	
LSD P = 0.01						15.4							

* Tuber characteristics: **bold** typeface = suitable, plain type = questionable, *italic* = unsuitable.
# Samples assessed visually: 1 - 10, 7 = borderline for French-fries, >7 = too dark.
† Flesh faults: indicates significantly different from Atlantic.
+ "skew" indicates data did not fulfil assumptions of analysis of variance.

Selections for district trials

No selections were made.

7.6 Sixteenth or "00" series of French-fry experiments

7.6.1. Background

Breeding lines of the "00" series from the Department of Primary Industries, Victoria, Agriculture division's Potato Breeding Program were tested. One unreplicated screening was completed.

7.6.2. Experiment 02AL34 – November 2002 planted unreplicated screening at Margaret River.

Aims

1. To select entries suitable for French-fry processing as well as the fresh market from the"00" series of Australian breeding lines.
2. To provide high quality seed for further tests.

Results

Selections from NPIC

259 selections were sent to WA. Nine were categorised as French-fries. Four were selected for screening in WA.

Screening in WA

Eleven entries were classified as French-fry types at harvest in WA (Table 7.6.2). Selections were compared with the standard main-crop variety Russet Burbank and standard early crop variety Shepody. Selection criteria were suitable tuber characteristics, specific gravity greater than 1.080, fry colour lighter than 6 and ACD less than 3. Two breeding lines, 00-15-25 and 00-26-1 were selected for further testing. These are shown in bold typeface in Table 7.6.2.

Table 7.6.2. Tuber characteristics, yield and quality of French-fry potato breeding lines in a November 2002 planted unreplicated screening at Margaret River. Selections in **bold** typeface.

Entry	Tuber* charact-eristics	SG	Yield >80g (t/ha)	Cook tests (NPIC 2002)			Final selection & notes
				Crisp#	Boil+		
				colour	ACD	Slough	
Selection criteria							
	yes	>1.080		<6	<3		
Russet Burbank	no	1.075	11	-	-	-	no
Shepody	no	1.066	25	-	-	-	no
00-10-2	no	-	-	-	-	-	no
00-4-7	?	1.082	33	6	1	3	no
00-6-31	yes	1.077	36	7	1	2	no
00-10-5	yes	1.078	32	7	2	2	no
00-11-2	rescreen	1.072	8	2	2	3	no
00-11-27	yes	1.078	41	5	3	2	no
00-13-12	?	1.069	37	5	2	2	no
00-15-5	no	-	-	-	-	-	no
00-15-25	**yes**	**1.082**	**25**	**5**	**1**	**2**	**yes**
00-26-1	**yes**	**1.083**	**39**	**6**	**2**	**2**	**yes**
00-69-5	yes	1.050	49	7	1	1	no

*Tuber characteristics (tc); yes = suitable, ? = questionable, no = unsuitable

Crisp colour; scale 1 - 10 (light to dark), >7 unacceptable for French fries.

+Boiling: ACD (after cooking darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy

8. French-fry Discussion

8.1 Summary

Four breeding lines have been identified which could provide the industry with benefits over the main-crop standard Russet Burbank. A summary showing the benefits these selections may give to the industry is shown in Table 8.1.

After discussions with WA Chip Company the following breeding lines were selected for further, commercial scale testing: 92-37-1 (Barman), 89-27-33 (MacRusset), 89-19-2 (Sleeping Beauty) and 94-42-10.

Two other breeding lines should be kept for testing for winter production for when the processor requires out-of-season potatoes. These are 89-27-6 (My Fry) and 96-141-12 (Windsor).

A summary of pertinent trial results and strengths and weaknesses of these selections follows.

Table 8.1. French-fry breeding lines selected for further testing from Project PT00010.

Breeding line	Main benefits over standard varieties	Where benefits will be delivered
89-19-2 (Sleeping Beauty)	better shape than Shepody	} early
	higher yield than Russet Burbank/Kennebec/Shepody	} early & main-crop
	larger tuber size than Russet Burbank	} early & main-crop
	higher SG than Russet Burbank/Kennebec/Shepody	} early & main-crop
	lighter fries than Russet Burbank/Kennebec/Shepody	} early & main-crop
	less internal disorders than Russet Burbank	} main-crop
	better storage colour than Russet Burbank	} main-crop
89-27-33 (MacRusset)	higher yield than Russet Burbank	}
	better shape than Russet Burbank	} main-crop
	larger tubers than Russet Burbank	}
92-37-1 (Barman)	higher yield than Russet Burbank	}
	better shape than Russet Burbank	} main-crop
	larger tubers than Russet Burbank	}
94-42-10	higher yield than Russet Burbank	}
	better shape than Russet Burbank	} main-crop
	larger tubers than Russet Burbank	}
	higher specific gravity than Russet Burbank	}
89-27-6 (My Fry)	out-of-season	frost free winter areas
96-141-12 (Windsor)	out-of-season	frost free winter areas

8.2 89-19-2 (Sleeping Beauty)

Breeding

89-19-2 was bred by the Department of Primary Industries, Victoria, Agriculture division's Potato Breeding Program at the National Potato Improvement Centre by Dr Roger Kirkham. Its parents were Denali x Onka.

Performance

The advantages of 89-19-2 (Sleeping Beauty) were described by Dawson & Mortimore (2000). It was shown to have advantages for both early and main cropping.

In early crops Dawson & Mortimore (2000) reported that 89-19-2 (Sleeping Beauty):

- had much better shape and size than Kennebec,
- had better shape and size than Shepody,
- averaged 30% greater yield than Kennebec and 44% greater yield than Shepody,
- always had higher specific gravity than Kennebec (average of 1.090 verses 1.078) and higher SG than Shepody in five out of six experiments (average 1.090 verses 1.082).
- had lighter fry colour than both Kennebec and Shepody, and
- had similar levels of internal defects compared with Kennebec and Shepody.

In main crops Dawson & Mortimore (2000) reported that 89-19-2 (Sleeping Beauty):

- had larger tuber size than Russet Burbank,
- averaged 9.6% greater yield than Russet Burbank,
- had higher specific gravity than Russet Burbank in six out of seven experiments (average of 1.083 verses 1.077),
- had equal or lighter fry colour than Russet Burbank,
- had less internal defects than Russet Burbank with an average of 5% against 13%,
- performed markedly better than Russet Burbank in Victorian storage cooking tests {e.g. *Ballarat North French Fry 10°C Storage 1993/94* in Kirkham (1995)}.
- did not have as good a shape as Russet Burbank, and
- was more prone to growth cracks.

The latest results of 89-19-2 (Sleeping Beauty) support these previous findings. In the November planted demonstration where growth was good (Table 7.2.3) 89-19-2 (Sleeping Beauty) had similar yield to Russet Burbank but higher specific gravity.

When all WA main-crop results for 89-19-2 (Sleeping Beauty) are averaged and compared with Russet Burbank they show that 89-19-2 (Sleeping Beauty) has: an 8% improvement in yield, a 36% increase in tuber size, substantially increased specific gravity (1.082 cf. 1.076) and lighter French-fries (Table 8.2.2.).

Table 8.2.2. Summary of fifth to tenth series of main-crop experiments of 89-19-2 (Sleeping Beauty). Results compiled from Dawson *et al. (*1998), Dawson & Mortimore (2000) and Section 7.2 of this report.

Entry & tuber* characteristics	Yield (t/ha)					Tuber		Mat-urity (wks)	Quality				
	Chats	Small	Medi-um	Over size	Fry Grade	no. per plant	av mkt wt(g)		SG	Fry# color (%)	Flesh faults (%)~	Bruise §	Cd@ (mg/kg fwt)
	0-80/ 100g	80/100-250/ 280g	280-450g	>450g	80/100-450g								
Averages for main-crop experiments from all series													
October- December plantings, n = 10										(n=5)		(n=4)	(n=1)
Russet Burbank	8.4	31.0	10.2	2.2	43.5	10.6	180	18	1.076	72	10	0.9	0.065
89-19-2 (S Beauty)	4.0	22.7	17.8	6.3	46.8	7.2	244	18	1.082	88	4	1.4	0.072

*Tuber characteristics; **bold** type = suitable, plain typeface = questionable, *italic* = unsuitable.
Factory assessment: % of samples in lightest cooking grade.
† Flesh faults; † indicates significantly different internal disorders from Russet Burbank.
§ Bruise tested with ball bearing. The lower the score the better. Score is average of 4 sites from each of 5 tubers.
@ Cd = cadmium - maximum permitted concentration = 0.1 mg/kg fresh weight.

Conclusion

89-19-2 (Sleeping Beauty) deserves further testing for French-fry processing in early and main cropping areas. Its storage ability should also be tested as this in one of its major strengths.

8.3 89-27-33 (MacRusset)

Breeding

89-27-33 (MacRusset) was bred by the Department of Primary Industries, Victoria, Agriculture division's Potato Breeding Program at the National Potato Improvement Centre by Dr Roger Kirkham. Its parents were Lemhi Russet and Maris Piper.

Performance

89-27-33 (MacRusset) was selected in main-crop experiments of the seventh to tenth series of experiments (Table 8.3).

Main-crop plantings.

89-27-33 (MacRusset) had better tuber characteristics than Russet Burbank in nine out of ten main-crop experiments (Dawson & Mortimore 2000, Tables 7.2.2.& 7.2.3). 89-27-33 averaged 4.0 t/ha or 9% greater yield than Russet Burbank (Table 8.3). 89-27-33 produced higher yield than Russet Burbank in seven out of nine main-crop experiments (Dawson & Mortimore 2000, Table 8.3). Average numbers of tubers set per plant was 8.6 compared with 10.9 for Russet Burbank. Fry Grade tubers of 89-27-33 averaged 198g compared with Russet Burbank's 169g. Specific gravity was slightly higher on average than Russet Burbank (1.078 versus 1.076) and crisp fry colour was lighter (4.4 versus 5.4). Bruise tests of 89-27-33 were similar to Russet Burbank with average bruise scores of 0.6 versus 0.9 respectively.

Cadmium level in tubers of 89-27-33 were not significantly (P<0.05) greater than Russet Burbank averaging 0.034 mg/kg-fresh-weight to Russet Burbank's 0.043 mg/kg. Dormancy of 89-27-33 was 12 weeks while Russet Burbank had a dormancy of 18 weeks.

Benefits compared with Russet Burbank

- better shape,
- larger tubers,
- higher yield.

Disadvantages compared with Russet Burbank

- fewer tubers set therefore seed costs will be increased,

Conclusion

89-27-33 (MacRusset) deserves further testing for main-crop French-fry processing.

Table 8.3. Summary of main-crop results for 89-27-33 (MacRusset) from the seventh to tenth series. Results for the seventh to ninth series and for 99BU4 of the tenth series from Dawson & Mortimore 2000.

Entry & tuber* characteristics	Yield (t/ha)					Tuber		Mat-urity	Quality				
	Chats 0-100g	Small 100-280g	Medi-um 280-450g	Over size >450g	Fry Grade 100-450g	no. per plant	av mkt wt (g)	(wks)	SG	Fry# color	Flesh faults (%)~	Bruise §	Cd@ (mg/kg fwt)
Averages for main-crop experiments													
October - November plantings, n = 9										(n=5)		(n=2)	(n=2)
Russet Burbank	8.3	33.0	9.4	1.2	43.6	10.9	169	17	1.076	5.4	5	0.9	0.043
89-27-33 (MacRusset)	5.8	28.9	14.4	4.4	47.6	8.6	198	17	1.078	4.4	1	0.6	0.034

*Tuber characteristics: **bold** type = suitable, plain typeface = questionable, *italic* = unsuitable.
Crisp samples assessed visually: 1 - 10, 7 = borderline for French-fries, >7 = too dark.
† Flesh faults; † indicates significantly different internal disorders from Russet Burbank.
§ Bruise tested with ball bearing. The lower the score the better. Score is average of 4 sites from each of 5 tubers.
@ Cd = cadmium - maximum permitted concentration = 0.1 mg/kg fresh weight.

8.4 92-37-1 (Barman)

Breeding

92-37-1 (Barman) was bred by the Department of Primary Industries, Victoria, Agriculture division's Potato Breeding Program at the National Potato Improvement Centre by Dr Roger Kirkham. Its parents were Mondial and 85-30-12.

Performance

92-37-1 (Barman) was selected in main-crop experiments of the eighth to tenth series of experiments (Dawson & Mortimore 2000 7 Section 7.2.4).

Main-crop plantings.

92-37-1 (Barman) had better tuber characteristics than Russet Burbank in all seven main-crop experiments (Table 8.4). 92-37-1 averaged 12.4 t/ha or 23% greater yield than Russet

Burbank (Table 8.4). 92-37-1 produced higher yield than Russet Burbank in seven out of seven main-crop experiments (Table 8.4). Average numbers of tubers set per plant was 8.3 compared with 10.7 for Russet Burbank. These tubers were larger with 92-37-1 producing tubers with an average marketable weight of 225g compared with Russet Burbank's 170g. Specific gravity was higher than Russet Burbank (1.077 versus 1.075) and crisp fry colour was similar with 92-37-1 scoring 5.3 to Russet Burbank's 5.2. However when French-fries were tested by processors Russet Burbank produced more fries in the lightest colour grade, 72% compared with 92-37-1's 55%. The two bruise tests of 92-37-1 were similar to Russet Burbank with average bruise scores of 1.3 versus 0.9 respectively. Cadmium level in tubers was measured once in a replicated experiment and levels in 92-37-1 were 0.045 mg/kg fresh weight, not significantly ($P<0.05$) different to Russet Burbank's 0.051 mg/kg fresh weight. Dormancy of 92-37-1 (Barman) was 10 weeks while Russet Burbank had a dormancy of 17 weeks. Victorian tests show that 92-37-1 has similar cooking after storage quality as Russet Burbank (Kirkham and Wilson 1998).

Benefits compared with Russet Burbank

- consistently higher yield,
- better shape,
- larger tubers.

Disadvantages compared with Russet Burbank

- fewer tubers set therefore seed costs will be increased,
- less fries in lightest colour grade.

Conclusion

92-37-1 (Barman) deserves commercial scale testing for main-crop French-fry processing.

Table 8.4. Average main-crop results for 92-37-1 (Barman) from the eighth to tenth series. Data from Dawson & Mortimore (2000) and Tables 7.2.2. & 7.2.3.

Entry & tuber* characteristics	Yield (t/ha)				Tuber		Mat-urity	Quality					
	Small 100-280g	Medi-um 280-450g	Over size >450g	Fry Grade 100-450g	no. per plant	av mkt wt (g)	(wks)	SG	Fry# color	Fry## color (%)	Flesh faults (%)~	Bruise §	Cd@ (mg/kg fwt)
Averages for main-crop experiments from WA tests													
October- December plantings, n = 7									(n=5)			(n=3)	(n=1)
Russet Burbank				43.6	10.7	183	17	1.076	5.2	72	1	0.9	0.051
92-37-1 (Barman)				58.6	8.3	194	18	1.078	5.3	55	3	1.3	0.045

*Tuber characteristics: **bold** type = suitable, plain typeface = questionable, *italic* = unsuitable.
Crisp samples assessed visually: 1 - 10, 7 = borderline for French-fries, >7 = too dark.
Factory assessment: % of samples in lightest cooking grade.
† Flesh faults; † indicates significantly different internal disorders from Russet Burbank.
§ Bruise tested with ball bearing. The lower the score the better. Score is average of 4 sites from each of 5 tubers.
@ Cd = cadmium - maximum permitted concentration = 0.1 mg/kg fresh weight.

8.5 94-42-10

Breeding

94-42-10 was bred by the Department of Primary Industries, Victoria, Agriculture division's Potato Breeding Program at the National Potato Improvement Centre by Dr Roger Kirkham. Its parents were Nampa x Maris Piper.

Performance

94-42-10 was selected in main-crop experiments of the tenth series of experiments (Table 8.5).

Main-crop plantings.

94-42-10 had better tuber characteristics than Russet Burbank in all five main-crop experiments (Table 8.5). 92-37-1 averaged 11.7 t/ha or 25% greater fry-grade (>100g) yield than Russet Burbank (Table 8.5). 94-42-10 produced higher yield than Russet Burbank in four out of five main-crop experiments (Table 8.5). Average numbers of tubers set per plant was 7.1 compared with 12.3 for Russet Burbank. These tubers were larger with 94-42-10 producing tubers with an average marketable weight of 204g compared with Russet Burbank's 154g. Specific gravity was higher than Russet Burbank (1.085 versus 1.077) and crisp fry colour was lighter with 94-42-10 scoring 3.9 to Russet Burbank's 4.8. Flesh faults were markedly higher in 94-42-10 compared with Russet Burbank. 94-42-10 had, on average, 16% of tubers affected with disorders, mainly fleck. In comparison Russet Burbank averaged 6%. The flecking was consistent in 94-42-10 occurring in all five experiments while Russet Burbank was affected by flesh faults in just one trial. The two bruise tests of 94-42-10 produced a lower score than Russet Burbank with average bruise scores of 0.2 versus 0.9 respectively. Cadmium level in tubers was measured once in a replicated experiment and levels in 94-42-10 were 0.033 mg/kg fresh weight, not significantly ($P<0.05$) different to Russet Burbank's 0.027 mg/kg fresh weight. These values were well below the MPC of 0.1 mg/kg fresh weight. Maturity of 84-42-10 was 17 weeks compared with 16 weeks of Russet Burbank. Dormancy of 94-42-10 was 12 weeks while Russet Burbank had a dormancy of 16 weeks.

Benefits compared with Russet Burbank

- better shape,
- consistently higher yield,
- larger tubers.
- consistently higher specific gravity,

Disadvantages compared with Russet Burbank

- fleck found in 16% of tubers.
- fewer tubers set therefore seed costs will be increased,

Conclusion

94-42-10 should be tested on a commercial scale for main-crop French-fry processing to determine whether its benefits out weigh the disadvantage of fleck and to assess its suitability for commercial production and processing.

Table 8.5. Summary of main-crop results for 94-42-10 from the tenth series.

Entry & tuber* characteristics	Spac-ing in rows (cm)	Yield (t/ha)					Tuber		Mat-urity	Quality				
		Chats 0-100g	Small 100-280g	Medi-um 280-450g	Over size >450g	Fry Grade 100-450g	no. per plant	av Mkt wt (g)	(wks)	SG	Fry# color	Flesh faults (%)~	Bruise §	Cd@ (mg/kg fwt)
Averages for main-crop experiments														
October- December plantings, n = 5										(n=4)			(n=2)	(n=1)
Russet Burbank		8.8	37.9	8.9	0.4	47.2	12.3	154	16	1.077	4.8	6	0.9	0.027
94-42-10		5.4	30.2	19.4	4.0	53.6	7.1	204	17	1.085	3.9	16	0.2	0.033
Tenth or "94" series of experiments														
Trial 97BU3F. October planted replicated screening at Margaret River 1997. 92-37-1 was selected. (Dawson & Mortimore 2000)														
Russet Burbank	33	7.7	62.3	9.8	0.4	72.6	13.4	162		1.081	5.0		-	-
94-42-10	24	4.4	38.6	15.3	3.7	57.5	7.4	183		1.089	3.0			
LSD 5%		3.6	16.6	8.7	skew	19.7	1.9	27		0.008	1.6		-	-
Trial 98MA6. October planted demonstration at Manjimup 1998. 94-42-10 selected. (Dawson & Mortimore 2000)														
Russet Burbank	30	4.6	42.3	10.5	1.2	54.0	9.8	164		1.082	3.3			0.027
94-42-10	24	2.0	35.2	28.7	6.5	70.5	6.5	224		1.095	3.7			0.033
LSD 5%		2.1	10.0	10.9	4.5	16.4	1.6	37		0.007	1.1			0.007
Trial 99BU4. October planted demonstration at Margaret River 1999, 94-42-10 selected despite internal disorders														
Russet Burbank	40	18.5	24.7	0.3	0.0	25.0	17.6	116	15	1.075	6	0	1.6	-
94-42-10	25	13.4	32.2	1.5	0.0	33.6	10.2	138		1.080		14†	0.2	-
Trial 00MA9.	October planted demonstration at Margaret River 1999.													
Russet Burbank	38	7.8	25.7	5.8	0.0	31.5	10.2	146	15	1.073	5	0	0.3	-
94-42-10	25	4.1	24.9	16.6	0.2	41.7	5.6	210		1.081		14†	1.2	-
Trial 01MA33.	October planted demonstration at Margaret River 1999.													
Russet Burbank	38	5.3	34.6	18.0	0.3	52.9	10.5		16	1.075	-	0	-	-
94-42-10	25	3.1	20.2	34.8	9.7	64.6	5.6		16	1.082	-	16†	-	

*Tuber characteristics: **bold** type = suitable, plain typeface = questionable, *italic* = unsuitable.
Crisp samples assessed visually: 1 - 10, 7 = borderline for French-fries, >7 = too dark.
† Flesh faults; † indicates significantly different internal disorders from Russet Burbank.
§ Bruise tested with ball bearing. The lower the score the better. Score is average of 4 sites from each of 5 tubers.
@ Cd = cadmium - maximum permitted concentration = 0.1 mg/kg fresh weight.

8.6 89-27-6 (My Fry)

Breeding

89-27-6 was bred at the National Potato Improvement Centre in Victoria by Dr Roger Kirkham. Its parents were Lemhi Russet and Maris Piper. This is the same cross as 89-27-33 (MacRusset)

Performance

89-27-6 was found to produce tubers with suitable processing quality from out-of-season, or February, plantings (Dawson *et al.* 1998, Dawson & Mortimore 2000). They found that at this planting time 89-27-6 (My Fry) had excellent French-fry attributes: higher average yield than Kennebec (48 versus 33 t/ha) and larger oblong tubers with relatively high specific gravity (1.075 compared to Kennebec's 1.061) and light fry colour.

Conclusion
89-27-6 (My Fry) should be tested for out-of-season production for the frozen French-fry industry. There is a possibility that this variety could be used to produce low input winter crops that could be an alternative, out-of-season supply for French-fry producers.

8.7 96-141-12 (Windsor)

A discussion on the performance of 96-141-12 (Windsor) can be found in Section 10.5. 96-141-12 was selected for its performance in May fresh market plantings where it was identified as a possible early French-fry variety with suitable appearance for the fresh market.

8.8 Outcomes achieved compared with initial objectives.

We wanted to identify improved French-fry varieties that would provide benefits to industry compared with the standard varieties.

The closure of Simplot plant changes our aims. We ceased looking for dedicated French-fry varieties to multi-purpose varieties that would suit the small remaining French fry processors and the fresh market.

Four varieties were identified that appear to have the potential to provide higher yield and larger tuber size compared with the main-crop standard Russet Burbank. These were 89-19-2 (Sleeping Beauty), 89-27-33 (MacRusset), 92-37-1 (Barman) and 94-42-10. 89-19-2 (Sleeping Beauty) and 94-42-10 also offered higher specific gravity than Russet Burbank. 89-19-2 (Sleeping Beauty) had less internal disorders, lighter fry colour and better storage colour than Russet Burbank. 89-27-33 (MacRusset), 92-37-1 (Barman) and 94-42-10 also offered better shape than Russet Burbank.

One variety, 89-27-6 (My Fry) that may be suited to out-of-season production was identified in the previous project (Dawson & Mortimore 2000) though it has yet to be tested on a commercial scale.

Another selection, 96-141-12 (Windsor) may be suited to out-of-season production for French-fries as well as winter production for the fresh market.

This reiteration of the benefits of the selections made during this project shows that the objectives of the project have been met. There is also evidence that our change in selection procedure, from dedicated French-fry to multipurpose varieties has been successful.

9. Fresh market results

9.1 Background

The fresh market is the largest production sector of the Western Australian potato industry. Nadine, a selection from earlier projects, has helped the WA industry to increase sales of fresh potatoes. Market share for Nadine increased from <1% in 1992/93 to 70% in 1998/99. For all of previous living memory the variety Delaware had accounted for 90% of WA production. However there is now consumer reaction against Nadine's culinary limitations. We are looking for new varieties with good appearance, high yield, versatile cooking quality and improved flavour.

Demonstrations of the eleventh series were completed. District trials and demonstrations were completed for the twelfth series of experiments. All activities for the thirteenth series were also completed. The district trials of the fourteenth series were completed and three screenings of the fifteenth series plus one for the sixteenth series were finished.

The finding of potato virus y (PVY) in the breeding line 90-2-6 (Bliss) and the variety Maris Piper in WA resulted in a temporary halt to the program. PVY has not been found previously in serological tests in WA. This meant that one district trial of the Fifteenth Series, one demonstration of the Fourteenth Series, a replicated screening and the winter unreplicated screening of the Sixteenth Series were not planted. Before work is re-started all material from the variety evaluation program must be tested for the virus. Sprouts from individual tubers will be tested before planting to ensure only virus free material is replanted.

9.2 Eleventh or "95" series of fresh market experiments

9.2.1 Background

Breeding lines of the "95" series from the Department of Primary Industries, Victoria, Agriculture division's Potato Breeding Program were tested. The three initial screenings, four district trials plus one disease screening were completed in 2000 and were reported by Dawson & Mortimore (2000). Four demonstrations and the second disease screening are reported here.

9.2.2. Experiment 00PE3 – May 2000 planted demonstration at Baldivis.

Aims

1. To demonstrate the performance of entries to growers and industry representatives.
2. To select, with the assistance of growers and industry representatives, entries deserving further testing for fresh market winter production. Selections must produce high yield of marketable size tubers. The current standards are Nadine and Mondial.

Results

Yield and quality data are shown in Table 9.2.2. Selections required suitable appearance (tuber characteristics), versatile cooking quality with specific gravity greater than 1.065,

tolerance to powdery scab (& potato cyst nematode desirable), high yields and no major faults. The specific gravity of Mondial, Nadine and 94-105-2 (Discus) was too low. 88-71-9 (Kaloorup King), Mondial and Nadine had unacceptably dark fry colour. 94-105-2 (Discus) and 95-92-12 (Kumarina) had poor boiling quality. 89-12-1 (Eureka), Nadine, 94-105-2 (Discus), 95-11-20 (Auski), 95-75-15 (Overlander), 95-76-2 (Pardoo) and 95-92-12 (Kumarina) were susceptible to powdery scab. Remaining entries were: 91-153-1 (Dynamite), Winter Gem, 94-59-2 (Baton) (despite flesh faults), 95-39-8 (Sentosa) and 95-83-11 (Sandfire). Note that 95-39-8 (Sentosa) had low yield but it has produced higher yields in previous trials (Dawson & Mortimore 2000). It has only been tested once for powdery scab tolerance. One of 95-39-8's (Sentosa's) parents is Mondial which is resistant to PCN. 95-11-20 (Auski) would have been the best if it had tolerance to powdery scab.

9.2.3 Experiments 00HA2A & B - July 2000 & February 2001 planted demonstrations at Myalup.

Aims

1. To demonstrate the performance of entries, suited to one or both plantings of the double cropping system of the Swan Coastal Plain, to growers and industry representatives.
2. To select, with the assistance of growers and industry representatives, entries deserving further testing.

Results

July planting

Yield and quality data are shown in Table 9.2.3.1. The current standard is Nadine. Selections need to have suitable appearance (tuber characteristics), versatile cooking quality with specific gravity greater than 1.065, high yields and no major faults. Delaware, 90-105-16 (Winter Gem), 94-73-2 (Kita), 95-81-1 (Roebuck), 95-83-11 (Sandfire) did not have suitable tuber characteristics. Specific gravity was too low for Mondial, Nadine and 90-105-16 (Winter Gem). 95-83-11 (Sandfire) also had very low yield. Of the remaining entries cooking quality was exceptional, with all but 89-12-1 (Eureka) and 88-71-9 (Kaloorup King), rating "good" to "excellent" in all categories. Of these entries with the most versatile cooking quality only 91-153-1 (Dynamite) and 95-12-2 (Willare) produced samples where most tubers had long lasting skin bloom. 95-12-2 (Willare) was the best entry from the "95" series of breeding lines.

February planting

This is the second of a pair of unreplicated demonstrations to test the suitability of new varieties for the double cropping system of the Swan Coastal Plain. Both cut and round seed were tested. Varieties that emerge well from cut seed under the hot planting conditions are preferred. Yield and quality data are shown in Table 9.2.3.2. The current standard is Delaware. Selections need to have suitable appearance (tuber characteristics), versatile cooking quality with specific gravity greater than 1.065, high yields and no major faults. Delaware, 88-71-9 (Kaloorup King), Mondial, 90-105-16 (Winter Gem), 95-39-8 (Sentosa),

Table 9.2.2. Yield and quality of fresh market entries in a May 2000 planted demonstration at Baldivis.

Planted: 19 May 2000 | Harvested: 20 October 2000 | Soil temperature at harvest: 20°C
Row spacing: 68 cm | Soil type: alkaline sand | Elevation: 20 m

Entry, tuber characteristics* & spacing in row		Yield (t/ha)						Rank by Grade No 1	Tuber no per plant	Quality								Disease reaction	
		Chats	Small	Med-ium	Large	Grade No 1	Over size			SG	Culinary tests#					Flesh† faults	% skin bloom	Pwd@ scab	PCN‡
	cm	0-70g	70-120g	120-350g	350-450g	70-450g	>450g				taste	salad	mash	micro	fry	(%)	(14 days)		
Delaware	20	3.3	11.5	23.7	0.2	35.5	0.0	7	7.7	1.073	**	**	**	*	*	0	0	tol	no
Mondial	15	1.5	6.3	32.4	3.5	42.1	0.5	3	4.9	1.063	*	*	*	**	nr	4	0	tol	yes
Nadine	25	1.2	7.2	29.5	1.6	38.4	0.3	5	6.0	1.053	*	***	**	**	nr	4	0	h sus.	yes
88-71-9 (Kaloorup King)	20	1.0	3.6	31.2	5.4	40.1	1.4	4	4.9	1.066	**	**	**	**	nr	2	0	tol	?
89-12-1 (Eureka)	20	0.7	3.9	38.5	0.6	42.9	0.3	2	4.1	1.082	**	*	*	**	***	0	20	sus.	yes
90-105-16 (Winter Gem)	20	6.5	7.4	26.6	0.0	34.0	0.0	9	8.7	1.071	**	*	**	**	**	6	48	tol	yes
91-153-1 (Dynamite)	25	0.7	3.3	24.7	0.7	28.7	0.0	14	4.5	1.080	**	*	*	**	**	0	8	tol	
94-59-2 (Baton)	25	1.0	4.1	28.7	1.6	34.5	0.3	8	4.9	1.079	*	*	**	**	**	10†	24	tol	?
94-105-2 (Discus)	25	1.4	5.3	24.5	1.4	31.2	0.5	12	5.4	1.064	*	nr	***	***	**	2	60	h sus.	?
95-11-20 (Auski)	25	2.2	5.5	25.5	1.5	32.5	0.3	11	7.7	1.066	**	**	***	**	**	0	0	h sus.	?
95-39-8 (Sentosa)	25	0.5	1.9	14.1	1.4	17.4	0.0	15	4.9	1.072	**	*	**	**	*	4	20	tol§	50%
95-75-15 (Overlander)	20	2.3	4.7	29.8	2.7	37.3	0.0	6	5.2	1.074	**	nr	**	**	**	8†	8	h sus.	?
95-76-22 (Pardoo)	25	1.8	4.8	27.4	0.5	32.7	0.0	10	5.4	1.079	**	***	***	**	**	12†	20	h sus.	50%
95-83-11 (Sandfire)	20	1.4	7.8	21.8	0.4	29.9	0.0	13	4.9	1.077	***	*	**	**	**	0	0	tol	?
95-92-12 (Kumarina)	25	2.2	10.9	32.1	0.0	43.0	0.3	1	7.3	1.069	*	nr	**	***	**	0	0	h sus.	50%

* Tuber characteristics: **bold** face = suitable, plain = questionable, *italic* = unsuitable.
# Potato Marketing Corporation assessment: *** = excellent, ** = good, * = fair, nr = not recommended.
† Flesh faults; † indicates significantly different internal disorders from Delaware.
@ Tested in disease screening trials, 2 consistent results over 2 seasons required: tol = tolerant, h sus = highly susceptible, ? = inconsistent results, § = 1 test only.
‡ Determined from literature, 50% indicates 50% chance of resistance due to one parent being resistant.

Table 9.2.3.1. Yield and quality of fresh market entries in a July 2000 planted demonstration at Myalup.

Planted: 18 July 2000 | Harvested: 19 December 2000 | Soil temperature at harvest: 24°C
Row spacing: 70 cm | Soil type: alkaline sand | Elevation: 10 m

Entry & tuber* characteristics	Spacing in rows (cm)	Yield (t/ha)						Rank by Grade No 1	Tuber no per plant	Quality							
		Chats	Small	Medium	Large	Grade No 1	Oversize			SG	Culinary tests#					Flesh† faults	% skin bloom (14 days)
		0-70g	70-120g	120-350g	350-450g	70-450g	>450g				taste	salad	mash	micro	fry		
Delaware	20	4.5	14.6	64.8	0.3	79.7	0.0	3	11.1	1.072	**	**	*	**	*	8	0
Mondial	15	4.9	9.3	68.3	3.0	80.6	0.2	2	7.3	1.063	**	***	**	***	*	0	20
Nadine	20	4.1	9.3	54.8	0.5	64.7	0.0	10	7.8	1.055	nr	***	**	**	nr	0	0
88-71-9 (Kaloorup King)	20	3.9	10.1	68.2	4.4	82.7	0.0	1	8.7	1.068	**	*	*	**	**	0	24
89-12-1 (Eureka)	20	3.3	6.7	64.9	2.9	74.5	0.7	5	7.8	1.078	**	*	**	***	***	0	32
90-105-16 (Winter Gem)	20	4.4	4.4	45.4	6.2	56.0	0.7	13	7.3	1.064	**	***	**	**	***	24	20
91-153-1 (Dynamite)	25	2.3	5.2	46.1	0.8	52.0	0.2	14	7.1	1.082	**	**	**	***	***	0	92
94-73-2 (Kita)	25	4.1	6.6	52.7	0.2	59.5	0.0	11	7.7	1.075	**	**	***	**	*	8	36
95-11-20 (Auski)	25	3.2	2.6	51.9	12.4	66.9	5.1	8	8.0	1.069	***	***	**	***	**	18	0
95-12-2 (Willare)	25	2.9	6.8	52.0	0.5	59.3	0.0	12	8.1	1.088	***	**	**	***	***	0	92
95-39-8 (Sentosa)	25	3.1	3.0	57.2	6.0	66.1	0.2	9	8.7	1.073	**	**	**	***	***	8	0
95-75-15 (Overlander)	15	3.9	5.3	57.1	6.1	68.5	1.5	7	5.6	1.082	***	***	***	***	***	4	4
95-81-1 (Roebuck)	25	3.2	4.7	62.3	3.9	70.9	0.3	6	8.6	1.078	**	***	**	**	**	0	4
95-83-11 (Sandfire)	20	2.5	1.8	29.6	2.5	33.8	2.5	15	5.1	1.081	***	***	***	***	***	8	0
95-92-15 (Munjina)	25	5.6	6.6	68.4	0.3	75.4	0.0	4	11.3	1.078	**	**	**	**	**	0	0

* Tuber characteristics: **bold** face = suitable, plain = questionable, *italic* = unsuitable.
# Potato Marketing Corporation assessment: *** = excellent, ** = good, * = fair, nr = not recommended.
† Flesh faults: † indicates significantly different from standard variety.

95-81-1 (Roebuck) and 95-92-15 (Munjina) did not have suitable tuber characteristics. The specific gravity of 88-71-9 (Kaloorup King), Mondial, Nadine, 90-105-16 (Winter Gem) and 95-11-20 (Auski) were too low. Of the remaining entries, 94-73-2 (Kita), 95-11-20 (Auski) and 95-12-2 (Willare), had only fair fry quality and did not fulfil the versatile cooking criterion. This left 91-153-1 (Dynamite), 89-12-1 (Eureka) and 95-83-11 (Sandfire).

Overall selections

91-153-1 (Dynamite) was selected at both planting times. 95-12-2 (Willare) was selected from the July planting while 89-12-1 (Eureka) and 95-83-11 (Sandfire) were selected from the February planting.

9.2.4. Experiment 00MA2 – October 2000 planted demonstration at Manjimup.

Aims

1. To demonstrate to growers and industry representatives the performance of entries suited to fresh and export market production from an October planting.
2. To select, with the assistance of growers and industry representatives, entries deserving further testing. Selections need to have suitable appearance (tuber characteristics), versatile cooking quality with specific gravity greater than 1.065, high yields and no major faults. The current standard is Nadine.

Results

Yield and quality results are shown in Table 9.2.4. Delaware, 91-153-1 (Dynamite), 88-71-9 (Kaloorup King), 93-96-9 (Karri), Mondial, 95-12-2 (Willare), 95-39-8 (Sentosa), 95-81-1 (Roebuck), 95-83-11 (Sandfire) and 95-92-15 (Munjina) did not have suitable tuber characteristics. The specific gravity of 88-71-9 (Kaloorup King), 93-96-9 (Karri), Mondial and Nadine was too low. Of the remaining entries three, 92-123-7 (Passion), 91-2-3 (Preston) and 95-11-20 (Auski) had good skin bloom after 14 days. 91-2-3 (Preston) has been tested by farmers for several years and has not found favour. 92-123-7 (Passion) appeared to have very good tolerance of skin blemish diseases and so should be selected despite its relatively low yield. 95-11-20 (Auski) should also be selected

9.2.5. Experiments 99PE6 & 00PE4 - Disease screening trials.

Aim

To determine reaction of entries to powdery scab disease and crocodile skin disorder.

Results

Results from the first screening were reported by Dawson & Mortimore (2000). They are repeated in Tables 9.2.5.1 and 9.2.5.2 in order to allow comparison with the results from the second screening.

Table 9.2.3.2. Yield and quality of fresh market entries in a February 2001 planted demonstration at Myalup.

Planted: 9 February 2001 | Harvested: 11 July 2001 | Soil temperature at harvest: 13°C
Row spacing: 75 cm | Soil type: alkaline sand | Elevation: 10 m

Entry & tuber* characteristics	Spacing in rows (cm)	Yield (t/ha)						Cut seed yield (% of round seed)	Rank by Grade No 1	Tuber no per plant	Quality							
		Chats	Small	Medium	Large	Grade No 1	Over size				SG	Culinary tests#					Flesh† faults	% skin bloom (14 days)
		0-70g	70-120g	120-350g	350-450g	70-450g	>450g					taste	salad	mash	micro	fry		
Delaware	20	4.0	12.6	35.2	1.6	49.4	0.0	10	111	10.0	1.062	**	**	**	**	*	0	0
Mondial	15	3.1	5.6	40.6	4.4	50.5	0.7	8	104	6.4	1.057	**	**	**	**	nr	0	20
Nadine	20	2.5	7.0	55.2	1.3	63.5	0.4	1	83	12.6	1.049	*	***	**	**	nr	0	0
88-71-9 (Kaloorup King)	20	2.6	4.6	38.4	7.1	50.1	7.0	9	114	7.0	1.058	**	**	**	**	nr	0	4
89-12-1 (Eureka)	20	1.4	4.7	50.7	0.8	56.1	0.0	4	96	7.3	1.073	**	**	**	***	***	0	20
90-105-16 (Winter Gem)	20	2.6	7.1	43.1	1.0	51.2	0.7	7	99	9.4	1.059	*	***	**	***	*	4	8
91-153-1 (Dynamite)	25	1.9	6.5	33.9	0.3	40.7	0.0	14	102	8.2	1.072	**	**	**	***	***	0	76
94-73-2 (Kita)	25	2.4	2.3	42.1	3.6	48.0	1.0	12	85	6.6	1.068	**	**	**	***	*	0	88
95-11-20 (Auski)	25	1.7	3.1	50.3	7.0	60.3	1.4	2	95	7.6	1.059	**	***	***	***	*	0	0
95-12-2 (Willare)	25	1.7	1.9	41.7	1.5	45.1	0.0	13	88	6.2	1.077	**	***	**	***	*	0	28
95-39-8 (Sentosa)	25	1.7	2.9	23.4	7.2	33.6	7.1	15	110	6.4	1.070	**	**	**	**	***	0	0
95-75-15 (Overlander)	15	2.3	5.7	38.0	8.8	52.5	4.0	6	87	5.4	1.071	**	***	**	***	***	20†	0
95-81-1 (Roebuck)	25	2.0	6.6	43.7	3.7	53.9	0.7	5	108	8.1	1.070	**	**	**	***	***	0	0
95-83-11 (Sandfire)	20	2.1	4.6	52.1	2.9	59.5	0.0	3	92	8.4	1.071	**	**	**	***	***	0	12
95-92-15 (Munjina)	25	2.9	12.3	36.2	0.0	48.5	0.0	11	104	9.6	1.073	***	**	**	**	*	2	12

* Tuber characteristics: **bold** face = suitable, plain = questionable, *italic* = unsuitable.
# Potato Marketing Corporation assessment: *** = excellent, ** = good, * = fair, nr = not recommended.
† Flesh faults: † indicates significantly different from standard variety.

Table 9.2.4. Yield and quality of fresh market entries in an October 2000 planted demonstration at Manjimup.

Planted: 27 October 2000 | Harvested: 13 March 2001 | Soil temperature at harvest: 16°C
Row spacing: 75 cm | Soil type: gravel loam | Elevation: 200 m

Entry & tuber* characteristics	Spacing in rows (cm)	Yield (t/ha)						Rank by Grade No 1	Tuber no per plant	Quality							
		Chats	Small	Medium	Large	Grade No 1	Oversize			SG	Culinary tests#					Flesh faults (%)†	% skin bloom (14 days)
		0-70g	70-120g	120-350g	350-450g	80-450g	>450g				taste	salad	mash	micro	fry		
Delaware	18	1.8	4.9	41.3	6.8	53.0	2.5	8	5.2	1.067	**	***	**	**	*	2	0
Mondial	15	7.1	12.0	34.9	0.5	47.5	0.0	9	8.7	1.059	**	**	**	**	*	0	0
Nadine	18	6.4	13.8	44.2	4.2	62.1	1.4	2	10.9	1.052	*	***	**	**	nr	6	88
88-71-9 (Kaloorup King)	20	7.1	11.7	30.1	3.0	44.8	0.0	11	10.9	1.059	**	**	nr	**	*	0	56
89-12-1 (Eureka)	20	3.5	5.3	49.0	6.4	60.6	4.0	5	7.7	1.077	*	*	*	***	**	12†	12
91-2-3 (Preston)	20	2.7	7.4	46.9	3.8	58.0	0.4	7	7.4	1.065	**	***	**	***	***	2	64
91-153-1 (Dynamite)	25	2.9	7.3	28.6	3.1	39.0	0.2	14	7.9	1.068	**	**	**	***	**	6	88
92-123-7 (Passion)	25	0.9	5.8	37.2	1.5	44.4	0.7	12	6.0	1.074	**	*	***	***	***	0	100
93-96-9 (Karri)	25	3.7	7.3	37.2	1.7	46.3	0.5	10	9.2	1.056	*	***	**	*	**	0	100
95-11-20 (Auski)	25	3.9	7.9	50.2	11.3	69.4	2.3	1	10.4	1.068	**	***	***	***	**	2	44
95-12-2 (Willare)	25	3.6	8.2	50.7	3.0	61.9	0.5	3	10.1	1.085	**	**	**	*	***	26†	4
95-39-8 (Sentosa)	25	3.9	6.5	22.0	5.2	33.7	2.2	15	9.0	1.080	**	***	nr	*	**	30†	4
95-81-1 (Roebuck)	25	2.3	4.7	49.6	5.3	59.5	1.0	6	8.2	1.082	*	**	*	**	***	2	0
95-83-11 (Sandfire)	20	1.6	4.4	30.8	4.3	39.5	6.7	13	5.4	1.068	**	***	***	***	***	22†	0
95-92-15 (Munjina)	25	3.5	6.6	51.6	3.0	61.2	0.0	4	9.6	1.085	**	**	**	**	***	0	0

* Tuber characteristics: **bold** face = suitable, plain = questionable, *italic* = unsuitable.
# Potato Marketing Corporation assessment: *** = excellent, ** = good, * = fair, nr = not recommended.
† Flesh faults: † indicates significantly different from standard variety.

Powdery scab

Powdery scab results are shown in Table 9.2.5.1. 95-83-11 (Sandfire) was the only entry tested in the demonstrations which was shown to be tolerant to powdery scab.

Crocodile skin

Crocodile skin results for both trials are shown in Table 9.2.5.2. Seven of the" 95" series breeding lines appear to be tolerant to crocodile skin, these were 95-11-20 (Auski), 95-12-2 (Willare), 95-75-15 (Overlander), 95-76-22 (Pardoo), 95-81-1 (Roebuck), 95-92-12 (Kumarina) and 95-92-15 (Munjina). 95-39-8 (Sentosa) after one test was also shown to be tolerant and a subsequent test in the next series of experiments confirmed this (see Table 9.3.9.2). 95-83-11 (Sandfire) was found to be highly susceptible to the disorder.

Table 9.2.5.1. Field tolerance to powdery scab of potato entries in a trial at Baldivis.

Entry	Trial				Susceptibility over both screenings
	99PE6		00PE4		
	Severity* score	Susceptibility rating~	Severity* score	Susceptibility rating~	
Delaware	0.40	tolerant	0.40	tolerant	tolerant
Desiree	0.04	tolerant control	0.01	tolerant control	tolerant
Nadine	0.70	highly sus	0.78	highly sus	highly sus
89-12-1 (Eureka)	0.58	susceptible	1.26	highly sus	
90-105-16 (Winter Gem)	0.06	tolerant	-	-	tolerant††
94-59-2 (Baton)	0.15	tolerant	0.11	tolerant	tolerant
95-11-20 (Auski)	1.20	highly sus	1.24	highly sus	highly sus
95-12-2 (Willare)	1.42	highly sus	1.28	highly sus	highly sus
95-26-3	1.87	highly sus	-	-	
95-39-8 (Sentosa)	-	-	0.35	tolerant	?†
95-42-1	1.06	highly sus	-	-	
95-69-8	0.82	highly sus	-	-	
95-75-15 (Overlander)	1.69	highly sus	1.57	highly sus	highly sus
95-76-22 (Pardoo)	0.79	highly sus	0.69	highly sus	highly sus
95-81-1 (Roebuck)	1.44	highly sus	1.52	highly sus	highly sus
95-83-11 (Sandfire)	0.24	tolerant	0.33	tolerant	**tolerant**
95-92-12 (Kumarina)	0.49	susceptible	0.72	highly sus	Sus to h sus
95-92-15 (Munjina)	0.96	highly sus	0.75	highly sus	highly sus
95-96-1	0.93	highly sus	-	-	
95-97-8	0.11	tolerant	-	-	
Significance	***		***		
LSD P = 0.05	0.42		0.47		
LSD P = 0.01	0.55		0.62		

* Severity = number of tubers with 0-5% surface covered with disorder + (tubers with 5-25% disorder x 2) + (tubers with >25% disorder x 3) divided by total number of tubers.

~ Rating = tolerant if severity score is not sig. diff (5%) to the tolerant control,
Rating = susceptible if the severity score is sig. greater (1%<P<5%) than the tolerant control,
Rating = highly susceptible if the severity score is highly significantly (P<1%) greater than the control.

† Inconsistent results shown in next series of experiments, see Table 9.3.9.1.

†† Consistent with previous tests (Dawson & Mortimore 2000).

Table 9.2.5.2. Field tolerance to crocodile skin of potato entries in a trial at Baldivis.

Entry	Trial				Susceptibility over both screenings
	99PE6		00PE4		
	Severity* score	Susceptibility rating~	Severity* score	Susceptibility rating~	
Delaware	1.21	highly sus	0.97	highly sus	highly sus
Desiree	2.45	highly sus	2.02	highly sus	highly sus
Nadine	0.09	tolerant control	0.26	tolerant control	tolerant
89-12-1 (Eureka)	1.10	highly sus	1.00	highly sus	highly sus
90-105-16 (Winter Gem)	0.98	highly sus	-	-	
94-59-2 (Baton)	1.77	highly sus	1.46	highly sus	highly sus
95-11-20 (Auski)	0.08	tolerant	0.02	tolerant	tolerant
95-12-2 (Willare)	0.05	tolerant	0.13	tolerant	tolerant
95-26-3	0.03	tolerant	-	-	
95-39-8 (Sentosa)	-	-	0.48	tolerant	tolerant†
95-42-1	1.16	highly sus	-	-	
95-69-8	1.22	highly sus	-	-	
95-75-15 (Overlander)	0.29	tolerant	0.36	tolerant	tolerant
95-76-22 (Pardoo)	0.17	tolerant	0.05	tolerant	tolerant
95-81-1 (Roebuck)	0.08	tolerant	0.06	tolerant	tolerant
95-83-11 (Sandfire)	0.53	highly sus	0.78	highly sus	highly sus
95-92-12 (Kumarina)	0.12	tolerant	0.20	tolerant	tolerant
95-92-15 (Munjina)	0.01	tolerant	0.01	tolerant	tolerant
95-96-1	0.22	tolerant	-	-	
95-97-8	1.08	highly sus	-	-	
Significance	***			***	
LSD P = 0.05	0.27			0.26	
LSD P = 0.01	0.36			0.35	

* Severity = number of tubers with 0-5% surface covered with disorder + (tubers with 5-25% disorder x 2) + (tubers with >25% disorder x 3) divided by total number of tubers.
~ Rating = tolerant if severity score is not sig. diff (5%) to the tolerant control,
Rating = susceptible if the severity score is sig. greater (1%<P<5%) than the tolerant control,
Rating = highly susceptible if the severity score is highly significantly (P<1%) greater than the control.
† Tolerance confirmed in next series of experiments, see Table 9.3.9.2.

9.2.6 Selections from the eleventh series of fresh market experiments

Four “95” series breeding lines were selected for further testing (Table 9.2.6).

95-11-20 (Auski) was selected for its performance at Manjimup. A summary of its performance can be found in the Fresh Market Discussion (Section 10.2).

95-12-2 (Willare) was selected for its performance in the July planting at Myalup.

95-39-8 (Sentosa) was selected for its performance in the April planting at Baldivis.

95-83-11 (Sandfire) was selected for its performance in the April planting at Baldivis as well as the February planting at Myalup.

Five breeding lines from previous series of experiments (Dawson & Mortimore 2000), all of which are already undergoing commercial testing, were also selected. These were 89-12-1 (Eureka), 90-105-16 (Winter Gem), 91-153-1 (Dynamite), 92-123-7 (Passion) and 94-59-2 (Baton).

9.3 Twelfth or "96" series of fresh market experiments

9.3.1 Background

Breeding lines of the "96" series from the Department of Primary Industries, Victoria, Agriculture division's Potato Breeding Program were tested. The three screenings of this series of experiments were completed during the previous project and results can be found in Dawson and Mortimore (2000). The results of four district trials and the four subsequent demonstrations follow.

9.3.2. Experiment 00PE2 – May planted district trial.

Aim

To select entries suited to fresh market production from a May planting. Early maturing varieties that produce large tubers with good appearance and versatile cooking quality under cold conditions are required.

Results

Yield and quality data are shown in Table 9.3.2. Selections had suitable tuber characteristics, specific gravity greater than 1.065 and after-cooking-darkening and slough should be moderate or better. Fry colour should be acceptable. It's important for May plantings that varieties have tolerance to powdery scab. Selections were 90-105-16 (Winter Gem), 96-23-7, 96-28-1 and 96-141-12. These will be tested with the best from last year's demonstration: 89-12-1 (Eureka), 94-59-2 (Baton), 95-39-8 (Sentosa) and 95-83-11 (Sandfire). Carlingford will also be added as it is undergoing large-scale tests with Western Potatoes.

9.3.3. Experiments 00HA1A & B - July 2000 & February 2001 planted district trials at Myalup.

Aim

To select entries suited to one or both plantings of the double cropping system of the Swan Coastal Plain.

Table 9.3.2. Yield and quality of fresh market entries in a May 2000 planted district trial at Baldivis.

Planted: 19 May 2000 | Harvested: 19 October 2000 | Soil type: alkaline sand
Row spacing: 68 cm | Soil temp. at harvest: 16°C | Elevation: 20 m

Entry & tuber* characteristics	Spacing in rows (cm)	Yield (t/ha)						Rank by Grade No.1	Tuber no. per plant	Quality			
		Chats 0-70g	Small 70-120g	Medium 120-350g	Large 350-450g	Grade No. 1 70-450g	Oversize >450g			SG	ACD @	Slough ing~	Fry# color
Carlingford	24	2.6	7.1	38.6	0.0	45.7	0.0	5	7.0	1.073	1.2	1.3	8.7
Coliban	15	2.3	6.6	30.2	0.0	36.8	0.0	15	4.0	1.071	1.0	1.3	6.7
Delaware	20	3.1	13.0	25.5	0.0	38.6	0.0	10	5.8	1.075	1.3	1.8	6.7
Granola	24	4.4	11.6	18.4	0.0	30.0	0.0	21	6.4	1.078	1.3	1.5	7.0
Mondial	15	2.5	6.4	44.8	4.9	56.0	0.4	1	4.6	1.065	1.7	2.2	7.3
Nadine	24	1.8	6.9	31.4	1.0	39.3	0.3	9	5.6	1.057	1.0	1.0	10.0
89-12-1 (Eureka)	20	1.2	5.1	41.2	1.5	47.8	0.3	3	4.7	1.080	1.5	2.5	6.0
90-40-1 (Ruby Lou)	20	1.9	6.2	44.6	1.8	52.5	0.4	2	5.2	1.080	1.3	1.7	6.3
90-105-16 (W'Gem)	20	4.2	6.8	31.2	0.0	37.9	0.0	13	5.3	1.066	1.8	1.5	6.7
95-11-25	24	2.5	10.9	25.0	0.0	35.8	0.0	16	6.1	1.084	1.0	1.0	6.0
96-4-5	24	1.3	3.8	25.6	1.6	31.1	0.0	20	4.4	1.085	1.3	2.0	5.7
96-23-7	24	1.4	5.3	26.0	0.0	31.3	0.0	19	4.5	1.079	1.7	1.5	4.7
96-28-1	30	3.2	9.7	9.2	0.0	18.9	0.0	25	5.7	1.075	1.5	1.3	7.0
96-28-5	30	3.3	8.7	19.0	0.0	27.7	0.0	23	6.3	1.094	1.8	4.5	7.0
96-29-7	24	4.2	10.8	21.8	0.0	32.5	0.0	17	6.5	1.070	1.2	1.5	5.7
96-87-1	30	3.6	10.7	26.5	0.9	38.1	0.0	12	8.5	1.075	1.2	2.2	5.3
96-88-7	24	3.2	7.6	30.6	0.0	38.2	0.0	11	7.0	1.078	1.3	2.2	6.7
96-102-1	30	0.6	2.6	20.9	0.2	23.7	0.0	24	4.2	1.079	1.7	2.3	6.7
96-125-31	24	1.9	5.3	24.1	0.0	29.3	0.0	22	4.8	1.078	1.3	1.5	6.7
96-125-36	20	2.3	6.8	24.5	0.0	31.3	0.0	18	4.3	1.079	1.2	2.2	7.0
96-134-3	24	1.1	8.8	34.5	0.0	43.2	0.0	6	5.8	1.087	1.2	3.0	6.3
96-136-4	24	1.0	2.1	25.1	10.4	37.6	2.3	14	5.0	1.084	2.3	1.3	6.7
96-136-9	24	1.3	4.3	35.9	6.3	46.5	0.8	4	5.4	1.078	1.3	1.0	6.7
96-141-12	24	1.4	4.1	34.1	2.2	40.5	0.0	8	5.0	1.081	1.8	2.7	6.7
96-144-13	24	2.6	11.1	30.9	0.7	42.7	0.3	7	6.9	1.088	1.8	2.2	4.7
Significance+		***	***	***		***			***	***	***	***	***
LSD P = 0.05		1.3	3.1	7.4	skew	7.7	ns		0.9	0.004	0.1	0.8	1.1

* Tuber characteristics: **bold** typeface = suitable, plain type = questionable, *italic* = unsuitable.
@ ACD (after-cooking-darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
~ Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy.
# Samples assessed visually after crisping: 1 - 10, 7 = borderline, >7 = too dark for domestic French-fries.
+ "skew" indicates data did not fulfil assumptions of analysis of variance.

Results

July selections

Yield and quality data are shown in Table 9.3.3.1. Selections had suitable tuber characteristics, significantly greater specific gravity than 1.065, with after-cooking-darkening and sloughing moderate or better. Fry colour had to be acceptable. Entries had to be free of major faults. Selections were 89-12-1 (Eureka), 90-40-1 (Ruby Lou), 96-23-7, 96-28-1, 96-87-1, 96-134-3 and 96-136-9. The following were not selected due to internal disorders: 91-106-1, 95-11-25, 96-29-7 and 96-102-1.

February selections

Yield and quality data are shown in Table 9.3.3.2. The trial grew well except for 96-125-31 which had virus like symptoms. Selections had suitable tuber characteristics with versatile cooking quality (slough and after-cooking-darkening better than moderate) with acceptable fry colour with no major faults with specific gravity not significantly (P<0.05) less than Delaware. Selections were 89-12-1 (Eureka), 90-40-1 (Ruby Lou), 96-4-5, 96-23-7, 96-134-3, 96-136-4 and 96-141-12. 96-28-1 was not selected as it had very low yield.

Overall selections

Selections common to both planting times were 89-12-1 (Eureka), 90-40-1 (Ruby Lou), 96-23-7 and 96-134-3. Entries selected only at the earlier planting were 96-28-1, 96-87-1 and 96-136-9. Entries selected only at the second planting were 96-4-5, 95-136-4 and 96-141-12.

Table 9.3.3.1. Yield and quality of fresh market entries in a July 2000 planted district trial at Myalup.

Planted: 18 July 2000 | Harvested: 18 December 2000 | Soil type: alkaline sand
Row spacing: 70 cm | Soil temp. at harvest: 24°C | Elevation: 20 m

Entry & tuber* characteristics	Spac-ing in rows (cm)	Yield (t/ha)						Rank by Grade No.1	Tuber no. per plant	Quality			
		Chats 0-70g	Small 70-120g	Med-ium 120-350g	Large 350-450g	Grade No. 1 70-450g	Over size >450g			SG	ACD @	Slou-gh ing~	Fry# color
Carlingford	24	2.1	8.3	52.3	0.7	61.3	0.0	11	8.5	1.073	1.0	1.0	8.0
Coliban	15	1.8	11.0	54.6	1.9	67.4	0.0	9	5.7	1.072	1.3	1.7	5.7
Delaware	20	2.8	14.8	55.8	2.0	72.6	0.0	5	8.1	1.072	1.3	1.2	6.7
Granola	24	4.8	13.6	28.5	0.0	42.1	0.0	23	8.4	1.077	1.5	1.3	7.0
Mondial	15	3.2	9.7	69.1	8.1	87.0	1.4	1	6.7	1.066	1.0	1.2	7.0
Nadine	20	2.5	13.1	46.7	0.5	60.4	0.0	12	7.4	1.058	1.8	1.2	9.0
89-12-1 (Eureka)	20	1.7	10.3	58.3	5.4	74.0	2.4	3	6.7	1.079	1.3	2.3	4.7
90-40-1 (Ruby Lou)	20	4.0	15.7	54.2	1.0	71.0	0.3	6	8.8	1.078	1.5	2.2	5.0
90-105-16 (W' Gem)	20	3.0	6.0	48.9	0.5	55.4	0.7	13	6.7	1.070	1.8	1.3	6.7
91-106-1	20	5.8	15.4	46.4	0.0	61.8	0.0	10	7.9	1.087	1.8	3.3	3.7
95-11-25	24	4.3	15.8	37.3	0.0	53.2	0.0	14	9.0	1.083	1.8	1.2	4.0
96-4-5	24	2.5	6.1	36.7	4.2	47.0	3.8	20	6.9	1.079	1.0	1.3	5.7
96-23-7	24	2.4	8.5	40.9	0.8	50.2	0.0	19	7.1	1.077	1.3	1.5	5.0
96-28-1	30	4.5	11.3	20.6	0.0	31.9	0.0	26	8.0	1.077	1.2	1.5	5.7
96-28-5	30	5.2	15.8	35.1	0.0	50.9	0.0	18	11.1	1.092	1.8	3.3	6.3
96-29-7	24	2.9	6.5	37.6	0.7	44.8	0.2	21	9.4	1.074	1.8	2.7	5.7
96-87-1	30	2.1	7.0	34.9	0.3	42.2	0.0	22	8.8	1.070	1.5	1.2	5.7
96-88-7	24	2.1	7.8	42.7	2.1	52.5	0.0	15	8.0	1.071	1.3	1.3	7.0
96-102-1	30	1.4	5.5	33.4	3.0	41.9	0.3	24	6.2	1.072	1.3	2.0	6.7
96-125-31	24	2.1	10.3	23.0	0.5	33.8	0.0	25	5.7	1.077	1.3	1.5	5.7
96-125-36	20	3.8	12.9	38.7	0.5	52.0	0.0	16	7.6	1.082	1.5	2.5	5.7
96-134-3	24	2.2	15.5	52.4	0.7	68.6	0.0	8	8.7	1.078	1.0	2.2	6.0
96-136-4	24	1.4	7.2	56.0	11.7	74.9	1.7	2	7.0	1.077	2.5	1.5	4.7
96-136-9	24	1.7	4.9	57.2	8.1	70.3	0.0	7	6.7	1.080	1.7	1.0	5.7
96-141-12	24	1.6	5.0	39.3	7.1	51.4	1.8	17	5.6	1.084	1.7	3.0	6.0
96-144-13	24	4.2	17.2	56.7	0.0	73.9	0.0	4	10.5	1.089	2.0	2.7	4.7
Significance+		***	***	***	skew	***	skew		***	***	***	***	***
LSD P = 0.05		1.6	5.8	11.7		11.0			1.3	0.005	0.6	0.7	1.4

* @ ~ # + See legend below table on pervious page

Table 9.3.3.2. Yield and quality of fresh market entries in a February 2001 planted district trial at Myalup.

Planted: 9 February 2001 Harvested: 9 July 2001 Soil type: alkaline sand
Row spacing: 70 cm Soil temp. at harvest: 13°C Elevation: 20 m

Entry & tuber* characteristics	Spac-ing in rows (cm)	Yield (t/ha)						Rank by Grade No.1	Tuber no. per plant	Quality			
		Chats 0-70g	Small 70-120g	Med-ium 120-350g	Large 350-450g	Grade No. 1 70-450g	Over size >450g			SG	ACD @	Slou-gh ing~	Fry# color
Carlingford	24	2.0	5.7	42.1	2.0	49.8	0.3	9	6.6	1.062	1.0	1.0	8.3
Coliban	15	2.5	6.8	41.9	9.1	57.8	4.1	3	4.9	1.060	1.2	1.8	6.3
Delaware	20	3.6	7.2	53.5	3.2	63.9	0.0	1	7.6	1.063	1.2	1.0	7.0
Granola	24	4.9	8.7	27.2	1.0	36.9	0.0	22	7.2	1.056	1.0	1.0	7.7
Mondial	15	3.1	6.8	40.7	11.5	58.9	7.4	2	5.2	1.055	1.3	1.2	7.3
Nadine	20	3.0	4.2	31.7	1.1	37.1	0.7	21	7.0	1.050	1.2	1.2	9.0
89-12-1 (Eureka)	20	2.0	6.4	47.8	3.1	57.2	0.0	4	6.3	1.073	1.5	2.5	4.0
90-40-1 (Ruby Lou)	20	1.7	6.8	42.4	3.3	52.5	2.5	7	5.6	1.065	1.5	1.3	5.0
90-105-16 (W' Gem)	20	3.0	8.9	41.1	1.0	51.0	0.0	8	7.2	1.059	1.5	1.7	5.7
95-11-25	24	3.0	6.5	45.3	3.3	55.1	1.7	6	7.7	1.067	2.2	1.0	5.3
96-4-5	24	1.3	3.1	34.4	4.2	41.8	6.8	15	5.3	1.065	1.3	1.0	6.3
96-23-7	24	2.2	3.6	42.3	1.7	47.6	0.4	11	6.0	1.063	2.0	1.5	5.0
96-28-1	30	2.3	6.1	30.6	1.9	38.6	0.0	19	7.1	1.064	1.8	2.7	6.7
96-28-5	30	5.8	15.7	24.8	0.0	40.5	0.0	17	12.5	1.077	1.3	4.0	6.0
96-29-7	24	2.5	10.1	31.0	1.6	42.8	0.0	14	7.2	1.059	1.5	2.2	5.3
96-87-1	30	3.5	9.8	23.1	1.2	34.1	0.0	24	7.9	1.058	1.5	1.2	6.3
96-88-7	24	3.1	5.2	35.0	1.1	41.4	1.2	16	7.2	1.056	1.5	1.7	7.0
96-102-1	30	0.9	1.8	28.9	5.6	36.3	1.6	23	5.5	1.060	1.2	1.5	4.7
96-125-31	24	1.6	5.7	25.9	0.0	31.5	0.0	25	5.0	1.062	1.5	1.0	6.3
96-125-36	20	3.4	5.6	42.4	1.2	49.2	0.3	10	5.7	1.070	1.5	2.7	7.3
96-134-3	24	3.5	11.0	43.4	1.0	55.4	0.0	5	8.8	1.068	1.2	2.7	6.0
96-136-4	24	1.3	1.6	24.5	11.1	37.1	16.3	20	5.1	1.066	2.5	1.7	6.3
96-136-9	24	1.5	2.9	30.0	6.3	39.2	16.5	18	5.5	1.065	2.0	1.0	5.7
96-141-12	24	1.4	1.8	41.2	4.0	47.0	0.0	13	6.1	1.075	1.5	2.8	4.3
96-144-13	24	1.8	4.8	37.4	5.2	47.3	1.4	12	6.3	1.077	1.3	2.2	4.3
Significance+		***	***	***	***	***	***		***	***	***	***	***
LSD P = 0.05		1.5	3.3	11.8	4.1	11.8	3.6		1.1	0.003	0.6	0.9	1.5

* Tuber characteristics: **bold** typeface = suitable, plain type = questionable, *italic* = unsuitable.
@ ACD (after-cooking-darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
~ Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy.
# Samples assessed visually after crisping: 1 - 10, 7 = borderline, >7 = too dark for domestic French-fries.
+ "skew" indicates data did not fulfil assumptions of analysis of variance.

9.3.4. Experiment 00MA1 - October 2000 planted district trial at Manjimup.

Aim

To select entries suited to fresh market production in an October planting. The industry requires a potato that has the appearance of Nadine but with more versatile culinary quality. The standard varieties are Nadine and Delaware.

Results

The trial grew well with high rates of emergence except for 96-88-7 which had only 19% of plants emerge. Yield and quality data are shown in Table 9.3.4. Specific gravity should be greater than 1.065 and after-cooking-darkening and slough should be moderate or better. Fry colour should be acceptable, yield should be close to Delaware and there should be no major faults. Selections were 95-11-25 and 96-136-4. 96-88-7, 96-102-1 and 96-134-3 had acceptable appearance and quality but their yields were very low. Ruby Lou suffered 47% internal disorders.

Table 9.3.4. Yield and quality of fresh market entries in an October 2000 planted district trial at Manjimup.

Planted: 27 October 2000 Harvested: 12 March 2001 Soil type: sandy loam
Row spacing: 80 cm Soil temp. at harvest: 16°C Elevation: 200 m

Entry & tuber* characteristics	Spac-ing in rows (cm)	Yield (t/ha)						Rank by	Tuber no. per plant	Quality				
		Chats 0-70g	Small 70-120g	Med-ium 120-350g	Large 350-450g	Grade No. 1 70-450g	Over size >450g	Grade No.1		SG	ACD @	Slou-gh ing~	Fry# color	Cd¢ mg/kg f. wt.
Carlingford	24	2.3	8.8	24.8	1.6	35.1	0.0	16	8.5	1.061	3.7	1.0	7.0	0.062
Coliban	15	1.4	4.2	38.0	5.2	47.4	0.0	7	3.9	1.066	3.3	1.3	5.3	-
Delaware	18	1.6	5.8	36.7	6.0	48.4	2.3	5	4.6	1.067	1.7	1.0	6.3	0.045
Granola	24	9.7	14.5	29.2	0.9	44.6	0.0	10	12.5	1.058	2.0	1.3	8.0	0.028
Mondial	15	5.7	13.2	33.7	3.0	49.8	0.3	4	10.0	1.059	3.0	1.3	6.3	-
Nadine	18	3.5	9.8	24.7	1.2	35.6	0.3	15	6.4	1.050	1.3	1.0	9.0	0.061
89-12-1 (Eureka)	20	3.2	9.6	46.7	5.1	61.4	1.5	1	7.2	1.071	4.8	2.2	5.3	-
90-40-1 (Ruby Lou)	20	1.7	8.3	38.9	2.9	50.0	0.3	3	5.6	1.071	3.3	1.2	5.7	-
90-105-16 (W'Gem)	20	6.9	14.4	22.3	0.0	36.6	0.0	14	9.5	1.056	4.0	1.3	4.7	-
95-11-25	24	8.5	18.6	29.8	0.0	48.3	0.0	6	11.3	1.070	2.5	1.0	4.7	0.031
95-97-8	24	1.0	3.0	31.2	3.1	37.3	0.3	12	5.2	1.056	1.3	1.3	6.0	0.038
96-4-5	24	2.0	5.8	26.2	1.8	33.8	0.0	17	5.9	1.069	1.3	1.7	5.7	-
96-23-7	24	3.4	8.3	36.0	2.1	46.4	0.0	8	8.1	1.057	1.3	1.7	6.3	0.038
96-28-1	30	1.5	4.8	9.7	0.0	14.5	0.0	24	5.4	1.066	2.2	1.7	6.0	-
96-28-5	30	7.5	11.9	16.3	0.3	28.5	0.0	21	10.0	1.070	2.3	1.7	4.7	-
96-29-7	24	2.7	8.7	15.6	0.7	25.0	0.0	23	8.3	1.065	3.8	1.7	5.0	-
96-87-1	30	3.2	7.5	27.4	2.0	36.9	0.3	13	7.3	1.059	2.5	1.3	5.0	0.061
96-88-7	24	0.5	1.9	20.0	4.2	26.1	1.0	22	16.5	1.065	2.5	1.7	6.0	0.044
96-102-1	30	0.9	3.6	24.8	2.4	30.8	1.0	19	4.8	1.067	3.2	1.2	5.3	0.035
96-125-31	24	4.7	8.5	4.0	0.0	12.5	0.0	25	4.5	1.065	1.3	1.0	4.3	-
96-134-3	24	6.7	14.0	17.5	0.0	31.4	0.0	18	8.3	1.072	2.3	2.8	5.7	0.055
96-136-4	24	1.3	3.6	33.1	9.5	46.1	6.8	9	5.1	1.083	4.0	1.3	4.7	0.023
96-136-9	24	1.9	7.6	32.2	2.6	42.4	0.3	11	6.0	1.072	3.7	1.0	4.3	0.032
96-141-12	24	0.4	2.8	18.9	8.2	29.9	2.0	20	3.5	1.074	4.8	1.7	5.3	0.034
96-144-13	24	1.8	9.4	43.6	2.9	55.9	0.6	2	7.4	1.086	2.2	1.7	5.0	-
Significance+		skew	***	***	skew	***	skew		***	***	***	skew	***	***
LSD P = 0.05			3.6	9.5		11.3			2.0	0.0	0.9		1.3	0.020

* Tuber characteristics: **bold** typeface = suitable, plain type = questionable, *italic* = unsuitable.
@ ACD (after-cooking-darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
~ Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy.
# Samples assessed visually after crisping: 1 - 10, 7 = borderline, >7 = too dark for domestic French-fries.
+ "skew" indicates data did not fulfil assumptions of analysis of variance.
¢ Cd = cadmium - maximum permitted concentration = 0.1 mg/kg fresh weight.

9.3.5. Selections for demonstrations of the twelfth series of fresh market trials.

The eight "96" series selections from the district trials are shown in Table 9.3.5 along with selections from other series. To be tested in demonstrations entries had to be selected in:

- the May district trial, or
- both double crop district trials (or at least perform exceptionally in one of these trials), or
- the Manjimup district trial.

These will be tested with 95-11-25 (Minilya), a crisp selection which could be suited to the fresh market (see Section 5.2.2), and entries selected in the previous series' demonstrations.

Table 9.3.5. Entries selected for testing in demonstrations of the twelfth series of fresh market trials.

Entry	Trial selected	Powdery scab reaction (from 1st screening in Table 9.3.9.1 unless otherwise indicated).	Comments	Re-test?
90-40-1 (Ruby Lou)	00HA1A 00HA1B	not tested	Already in commercial tests	ABT*
89-12-1 (Eureka)	00HA1A 00HA1B	not tested	Already in commercial tests	ABT*
90-105-16 (Winter Gem)	00PE2	not tested	Already in commercial tests	ABT*
95-11-25 (Auski)	00MA1	not tested	Selections from previous series' demonstration	ABT*
96-4-5	00HA1B	tolerant	Only selected in one of the double cropping trials	no
96-23-7	00PE2 00HA1A 00HA1B	susceptible	Selected in both DC plant times	yes
96-28-1	00PE2 00HA1A	tolerant		yes
96-87-1	00HA1A	highly susceptible	Only selected in one of the double cropping trials	no
96-134-3	00HA1A 00HA1B	highly susceptible	Selected in both DC plant times	yes
96-136-4	00HA1B 00MA1	highly susceptible		yes
96-136-9	00HA1A	highly susceptible	Only selected in one of the double cropping trials but high yield	yes
96-141-12	00PE2 00HA1B	tolerant		yes

* ABT = already being tested

9.3.6. Experiment 01PE9 - May 2001 planted demonstration at Mandogalup.

Aims

1. To demonstrate the performance of entries to growers and industry representatives.
2. To select, with the assistance of growers and industry representatives, entries deserving further testing for fresh market winter production. Selections must produce high yield of marketable size tubers. The current standards are Nadine, Delaware and Mondial.

Results

Yield and quality data are shown in Table 9.3.6.1 on the following page. Selections need to have suitable appearance (tuber characteristics), versatile cooking quality with specific gravity greater than Delaware (1.062), tolerance to powdery scab, high yields and no major faults. Resistance to PCN is an advantage. Carlingford, Delaware and 96-23-7 (Coromal) had unsuitable tuber characteristics. The specific gravity of Mondial and Nadine was too low. Carlingford, Mondial, Nadine and 95-39-8 (Sentosa) had unacceptably dark fry colour. 89-12-1 (Eureka), Nadine, 96-23-7 (Coromal) and 96-141-12 (Windsor) were susceptible to powdery scab. 95-39-8 (Sentosa) may also be susceptible to powdery scab as it showed inconsistent results (Table 9.3.9.1). This left 94-59-2 (Baton), 95-83-11 (Sandfire), 90-105-16 (Winter Gem) and 96-28-1 (Jayco). 96-28-1 (Jayco) produced small tubers with an average weight of just 89 g compared with 94-59-2 (Baton) 165g, 95-83-11 (Sandfire) 155g and 90-105-16 (Winter Gem) 116g. 90-105-16 (Winter Gem) has already been tested commercially and its skin finish was too delicate from May plantings for commercial handling. 94-59-2 (Baton) and 95-83-11 (Sandfire) had similar performance.

These results were discussed with the Potato Variety Commercialisation Group (December 2001). They considered that no variety had outstanding performance and so 95-83-11 (Sandfire), which had already been selected for commercial evaluation for February plantings, was the obvious choice for further testing and commercial evaluation for May plantings, on the condition that it was also selected in other demonstrations.

96-141-12 (Windsor) deserves further consideration because it may provide the industry with an early, multi-purpose French-fry variety. If 89-12-1 (Eureka) is used as an early French-fry control variety then it can be seen that 96-141-12 (Windsor) had equal French-fry cooking quality, similar yield and specific gravity (Table 9.3.6.1) but larger tuber size. Average tuber size of 96-141-12 (Windsor) and 89-12-1 (Eureka) found in three experiments are shown in Table 9.3.6.2. 96-141-12 produced larger tubers in the three winter planted experiments with marked improvement of 26% and 43% in two of these plantings.

Table 9.3.6.2. Tuber size of 96-141-12 (Windsor) & 89-12-1 (Eureka) in three winter experiments.

Experiment & section where reported	Month of planting	Variety		Percentage increase of Windsor tubers compared with Eureka
		89-12-1 (Eureka)	96-141-12 (Windsor)	
		Average tuber weight (g)		
00PE2 – 9.3.2	May	161	173	7%
00HA1A – 9.3.3	July	182	229	26%
01PE9 – 9.3.6	May	129	185	43%

Table 9.3.6.1. Yield and quality of fresh market entries in a May 2001 planted demonstration at Mandogalup.

Planted: 22 May 2001 | Harvested: 26 October 2001 | Soil temperature at harvest: 19°C
Row spacing: 72 cm | Soil type: alkaline sand | Elevation: 20 m

Entry, tuber characteristics* & spacing in row		Yield (t/ha)						Rank by Grade No 1	Tuber no per plant	Quality								Disease reaction	
		Chats	Small	Med-ium	Large	Grade No 1	Over size			SG	Culinary tests#					Flesh† faults	% skin bloom	Pwd scab	PCN‡
	cm	0-70g	70-120g	120-350g	350-450g	70-450g	>450g				taste	salad	mash	micro	fry	(%)	(14 days)	@	
Carlingford	25	9.1	17.6	14.9	0.0	32.6	0.0	11	12.8	1.065	***	***	***	**	nr	2	76	tol	-
Delaware	25	6.1	11.3	31.3	0.0	42.7	0.0	7	10.9	1.062	**	**	**	**	*	0	0	tol	no
Mondial	15	2.3	5.8	46.6	8.7	61.0	3.3	1	5.5	1.056	*	***	**	**	nr	2	28	tol	yes
Nadine	25	9.7	16.0	26.7	0.3	43.0	0.0	6	13.3	1.052	*	***	**	**	nr	0	12	h sus.	yes
89-12-1 (Eureka)	20	3.6	9.7	41.1	0.0	50.9	0.0	3	8.0	1.071	*	**	**	**	***	0	0	susc.	yes
90-105-16 (Winter Gem)	20	7.5	15.7	31.7	0.0	47.5	0.0	4	9.3	1.065	**	***	**	***	*	0	92	tol	yes
94-59-2 (Baton)	25	2.4	4.4	34.2	3.1	41.7	1.6	9	6.9	1.070	***	***	***	***	*	4	24	tol	no
95-39-8 (Sentosa)	25	0.8	4.2	34.9	3.5	42.6	1.1	8	8.3	1.063	***	**	***	***	nr	0	8	?	50%
95-83-11 (Sandfire)	25	2.8	4.2	32.7	2.2	39.1	0.0	10	7.2	1.066	**	***	***	**	***	0	24	tol	no
96-23-7 (Coromal)	25	3.1	9.1	34.8	0.3	44.2	0.0	5	8.4	1.071	**	***	***	***	*	8†	24	susc.	no
96-28-1 (Jayco)	30	6.2	8.2	14.5	0.0	22.7	0.0	12	10.4	1.072	***	**	***	**	**	0	20	tol	no
96-141-12 (Windsor)	25	2.2	4.9	43.0	5.8	53.7	0.6	2	6.5	1.072	**	*	***	***	***	4	8	?	50%

* Tuber characteristics: **bold** face = suitable, plain = questionable, *italic* = unsuitable.
# Potato Marketing Corporation assessment: *** = excellent, ** = good, * = fair, nr = not recommended.
†Flesh faults; † indicates significantly different internal disorders from Delaware.
@ Tested in disease screening trials, 2 consistent results over 2 seasons required: tol = tolerant, h sus = highly susceptible, ? = inconsistent results, § = 1 test only.
‡ Determined from literature, 50% indicates 50% chance of resistance due to one parent being resistant.

9.3.7. Experiments 01BU5A & B - July 2001 & January 2002 planted demonstrations at Jindong.

Aims

1. To demonstrate the performance of entries suited to one or both plantings of the double cropping system of the Swan Coastal Plain, to growers and industry representatives.
2. To select, with the assistance of growers and industry representatives, entries deserving further testing. Selections need to have suitable appearance (tuber characteristics), versatile cooking quality with specific gravity similar to Delaware (or at least greater than 1.065), high yields and no major faults.

Results and discussion

July planting

Yield and quality data are shown in Table 9.3.7.1. The current standard is Nadine. The trial grew well but tuber size was smaller than expected. Tuber characteristics were unsuitable for Delaware (deep distorted eyebrows) and 96-136-4 (Crusher) (bulging eyebrows). Tuber characteristics were questionable for 89-12-1 (Eureka) (small size) and 95-11-25 (Minilya) (small size). Nadine and Carlingford produced tubers with low specific gravity. Taste was unsuitable for 96-136-4 (Crusher) and 96-136-9 (Viscount). Fry quality was not suitable for Nadine. Mash quality was unsuitable for 96-136-9 (Viscount) and only fair for 96-23-7 (Coromal), 96-134-3 (Roadstar) and 96-136-4 (Crusher). As this is the major use mash quality should be good or better. Remaining entries were 95-11-20 (Auski), 95-83-11 (Sandfire) and 95-12-2 (Willare). All had outstanding cooking quality though 95-11-20 (Auski) and 95-12-2 (Willare) had much better bloom than 95-83-11 (Sandfire). Yield of these selections varied from 55.2 t/ha for 95-11-20 (Auski), 48.9 t/ha for 95-83-11 (Sandfire) down to 44.6 t/ha for 95-12-2 (Willare).

A review of the performances of 95-12-2 (Willare) and 95-83-11 (Sandfire) over the last three July planted tests shows that 95-12-2 (Willare) and 95-83-11 (Sandfire) have only produced 42 and 43 t/ha respectively compared with Delaware's and 95-11-20's (Auski's) 59 t/ha {Experiment 99HA1A (Dawson & Mortimore 2000), Experiment 00HA2A (Section 9.2.3) and this experiment}. Therefore 95-83-11 (Sandfire) should not be tested further in July plantings because 95-11-20 (Auski) has better yield potential.

January planting

This is the second of a pair of unreplicated demonstrations to test the suitability of new varieties for the double cropping system of the Swan Coastal Plain. Both cut and round seed were tested for each variety. Varieties that emerge well from cut seed under the hot planting conditions are preferred. Yield and quality data are shown in Table 9.3.7.2. The demonstration was not watered enough from maturity onwards and yields were lower than expected. Cut seed performed better than round seed for many varieties due to round

Table 9.3.7.1. Yield and quality of fresh market entries in a July 2001 planted demonstration at Jindong.

Planted: 27 July 2001 | Harvested: 12 December 2001 | Soil temperature at harvest: 15°C
Row spacing: 75 cm | Soil type: sand loam | Elevation: 40 m

Entry & tuber* characteristics	Spacing in rows (cm)	Yield (t/ha)						Rank by Grade No 1	Tuber no per plant	Quality							
		Chats	Small	Medium	Large	Grade No 1	Oversize			SG	Culinary tests#					Flesh† faults	% skin bloom
		0-70g	70-120g	120-350g	350-450g	70-450g	>450g				taste	salad	mash	micro	fry	(%)	(14 days)
Carlingford	25	4.6	16.2	40.5	0.0	56.7	0.0	3	11.9	1.066	**	***	**	**	*	0†	0
Delaware	25	4.6	20.5	29.3	2.8	52.6	0.0	5	11.8	1.073	**	**	**	**	*	10	0
Nadine	25	3.4	12.4	37.8	8.0	58.3	1.0	2	11.1	*1.057*	*	***	**	**	nr	0†	0
89-12-1 (Eureka)	20	6.2	24.5	26.6	0.0	51.1	0.0	6	11.1	1.083	*	**	**	**	***	0†	100
95-11-20 (Auski)	20	2.7	11.8	43.5	0.0	55.2	0.0	4	8.1	1.069	**	***	**	**	***	4	88
95-11-25 (Minilya)	30	9.3	11.5	30.8	0.0	42.3	0.0	12	16.7	1.082	**	***	**	**	***	14	0
95-12-2 (Willare)	25	4.1	16.1	28.5	0.0	44.6	0.0	10	10.1	1.084	**	***	**	**	***	4	72
95-83-11 (Sandfire)	20	2.4	10.8	37.7	0.4	48.9	0.0	8	6.7	1.086	**	**	***	**	***	0†	0
96-23-7 (Coromal)	25	4.5	14.3	30.3	0.0	44.6	0.0	11	10.6	1.076	**	*	*	**	***	8	44
96-134-3 (Roadstar)	25	0.7	22.3	25.4	0.0	47.7	0.0	9	9.8	1.085	**	**	*	**	***	0†	0
96-136-4 (Crusher)	20	1.6	4.5	53.3	8.7	66.5	0.3	1	6.4	1.077	nr	**	*	*	*	0†	0
96-136-9 (Viscount)	20	1.3	7.6	40.2	1.2	49.0	0.0	7	6.3	1.075	nr	**	nr	**	*	2	0

* Tuber characteristics: **bold** face = suitable, plain = questionable, *italic* = unsuitable.
# Potato Marketing Corporation assessment: *** = excellent, ** = good, * = fair, nr = not recommended.
† Flesh faults: † indicates significantly different from standard variety.

Table 9.3.7.2. Yield and quality of fresh market entries in a January 2002 planted demonstration at Jindong.

Planted: 25 January 2002 | Harvested: 29 May 2002 | Soil temperature at harvest: 10°C
Row spacing: 75 cm | Soil type: sandy loam | Elevation: 40 m

Entry & tuber* characteristics	Spacing in rows (cm)	Yield from round seed (t/ha)						Cut seed yield		Rank by Grade No 1	Tuber no per plant	Quality							
		Chats	Small	Medium	Large	Grade No 1	Oversize	t/ha	% of round seed			SG	Culinary tests#					Flesh† faults (%)	% skin bloom (14 days)
		0-70g	70-120g	120-350g	350-450g	70-450g	>450g						taste	salad	mash	micro	fry		
Carlingford	25	4.1	11.2	10.3	0.0	21.5	0.0	39.4	183	10	8.3	1.066	**	***	**	***	**	0	88
Delaware	20	5.3	20.7	23.4	0.0	44.1	0.0	44.0	100	2	9.2	1.067	**	***	**	**	**	0	80
Nadine	20	5.4	12.2	13.7	0.0	25.9	0.0	33.7	130	8	15.3	1.055	*	***	**	***	nr	2	96
89-12-1 (Eureka)	20	7.1	13.5	8.5	0.0	22.1	0.0	38.8	176	9	8.6	1.083	**	**	**	*	**	0	100
95-11-20 (Auski)	20	2.6	13.4	37.5	0.3	51.1	0.0	49.7	97	1	7.4	1.075	**	***	***	**	***	0	92
95-11-25 (Minilya)	30	1.3	6.6	24.2	4.1	34.8	1.9	41.5	119	6	6.9	1.084	**	**	**	**	**	24†	100
95-12-2 (Willare)	25	3.6	14.8	21.0	0.0	35.8	0.0	35.2	98	4	9.6	1.084	**	***	*	**	**	0	100
95-83-11 (Sandfire)	20	2.0	9.7	31.0	0.8	41.5	0.0	38.5	93	3	6.0	1.082	***	**	**	***	**	0	100
96-134-3 (Roadstar)	25	5.0	16.2	18.8	0.0	35.0	0.0	32.5	93	5	11.1	1.078	***	**	***	***	***	0	100
96-23-7 (Coromal)	25	2.5	9.1	18.7	0.3	28.1	0.0	43.0	153	7	6.7	1.070	***	**	***	**	**	6	100
96-136-4 (Crusher)	20	1.3	4.9	12.5	0.0	17.4	0.0	29.6	170	11	6.4	1.080	*	***	*	*	**	0	8
96-136-9 (Viscount)	20	2.1	5.3	10.1	0.8	16.1	0.0	35.9	223	12	8.0	1.078	**	***	*	**	**	0	100

* Tuber characteristics: **bold** face = suitable, plain = questionable, *italic* = unsuitable.
# Potato Marketing Corporation assessment: *** = excellent, ** = good, * = fair, nr = not recommended.
† Flesh faults: † indicates significantly different from standard variety.

Table 9.3.8. Yield and quality of fresh market entries in an October 2001 planted demonstration at Manjimup.

Planted: 9 October 2001 | Harvested: 21 February 2002 | Soil temperature at harvest: 19°C
Row spacing: 80 cm | Soil type: sandy loam | Elevation: 200 m

Entry & tuber* characteristics	Spacing in rows (cm)	Yield (t/ha)						Rank by Grade No 1	Tuber no per plant	Quality							
		Chats	Small	Medium	Large	Grade No 1	Oversize			SG	Culinary tests#					Flesh faults (%)†	% skin bloom (14 days)
		0-70g	70-120g	120-350g	350-450g	70-450g	>450g				taste	salad	mash	micro	fry		
Carlingford	25	3.5	10.7	47.9	1.3	59.9	0.2	7	11.4	1.073	***	***	**	**	***	0	0
Delaware	15	2.2	9.1	54.0	1.7	64.8	0.5	3	6.3	1.067	**	***	**	*	**	2	0
Nadine	15	6.6	17.1	59.1	0.8	77.0	0.6	1	10.2	1.056	*	***	**	**	nr	0	0
Saxon	25	3.1	5.9	53.1	4.6	63.6	1.3	5	10.1	1.076	**	***	**	**	**	8	0
89-12-1 (Eureka)	20	2.3	8.0	53.6	3.8	65.4	1.9	2	8.9	1.079	**	**	**	**	***	0	0
92-123-7 (Passion)	25	4.9	8.2	41.7	0.3	50.3	0.2	11	10.5	1.077	**	***	**	**	***	0	64
94-105-2 (Discus)	25	5.7	11.9	41.9	0.6	54.4	0.0	9	13.0	1.065	**	***	**	**	***	0	0
95-11-20 (Auski)	25	2.6	6.7	54.1	3.5	64.2	1.3	4	10.2	1.069	**	***	**	*	***	0	0
95-11-25 (Minilya)	30	6.1	13.3	41.4	0.9	55.5	0.4	8	16.6	1.075	**	***	***	**	***	16†	4
95-83-11 (Sandfire)	20	1.7	4.9	42.3	2.7	49.9	1.4	12	6.3	1.082	***	**	***	***	***	8	0
96-23-7 (Coromal)	30	2.3	4.1	41.4	2.6	48.1	0.4	13	12.4	1.070	*	**	*	**	**	10	24
96-134-3 (Roadstar)	30	2.6	7.0	34.5	2.0	43.5	0.0	14	11.5	1.072	**	***	***	***	***	0	0
96-136-4 (Crusher)	20	0.6	3.2	46.2	10.8	60.1	5.7	6	5.7	1.083	**	*	***	*	**	0	0
96-136-9 (Viscount)	25	0.8	2.9	38.7	10.0	51.6	5.9	10	6.4	1.075	**	***	**	*	**	0	0

* Tuber characteristics: **bold** face = suitable, plain = questionable, *italic* = unsuitable.
# Potato Marketing Corporation assessment: *** = excellent, ** = good, * = fair, nr = not recommended.
† Flesh faults: † indicates significantly different from Delaware.

seed being too dormant. Tuber characteristics were suitable for 95-11-20 (Auski), 96-23-7 (Coromal), 89-12-1 (Eureka), Nadine, 96-134-3 (Roadstar), 95-83-11 (Sandfire) and 95-12-2 (Willare). Tuber characteristics were questionable for Carlingford, 96-136-4 (Crusher), 95-11-25 (Minilya) and 96-136-9 (Viscount). Of these 95-11-20 (Auski), 96-23-7 (Coromal), 96-134-3 (Roadstar) and 95-83-11 (Sandfire) had the best cooking quality. All these had good bloom-after-storage and no major faults. Round seed yield was highest for 95-11-20 (Auski) at 51 t/ha, then came 95-83-11 (Sandfire), 96-134-3 (Roadstar) and 96-23-7 (Coromal). Cut seed yield found 95-11-20 (Auski) again highest (50 t/ha) but 96-23-7 (Coromal) was next (43 t/ha), then 95-83-11 (Sandfire) (39) and 96-134-3 (Roadstar) (33). It was decided that 95-11-20 (Auski) was the best performer with the highest yield and equal to best quality. 95-83-11 (Sandfire) was the farmers' choice at the field day but it is not likely to outperform 95-11-20 (Auski). In the last three January/February plantings Sandfire averaged 45 t/ha compared with 95-11-20's (Auski's) 54 t/ha {Experiment 99HA1B (Dawson & Mortimore 2000), Experiment 00HA2B (Section 9.2.3) and this experiment}.

Overall selections

95-11-20 (Auski) was selected at both planting times. No other selections were made.

9.3.8. Experiment 01MA12 – October 2001 planted demonstration at Manjimup.

Aims

1. To demonstrate to growers and industry representatives the performance of entries suited to fresh and export markets from an October planting.
2. To select, with the assistance of growers and industry representatives, entries deserving further testing. Selections need to have suitable appearance (tuber characteristics), versatile cooking quality with specific gravity greater than 1.064, high yields and no major faults. The current standard is Nadine.

Results

Yield and quality results are shown in Table 9.3.8. Candidates for selection were Carlingford, 94-105-2 (Discus), 89-12-1 (Eureka), 92-123-7 (Passion) and 96-134-3 (Roadstar). The last two had low yield and should not be selected. 92-123-7 (Passion) has been tested on a larger scale for 3 years to see whether yields could be increased but with no success. 94-105-2 (Discus) also had lowish yield. It may be tolerant to skin blemish disease and is free from after-cooking-darkening. It should be retested in next year's demonstration. This left Carlingford and 89-12-1 (Eureka). Both are already undergoing large scale testing. Therefore no new selections were made. 95-11-20 (Auski) was selected in last year's demonstration: its only fault in this test was questionable tuber characteristics due to prominent lenticels. In four previous tests however, 95-11-20 (Auski) has had suitable tuber characteristics, high yield and excellent cooking quality.

The export fresh market requires high yielding, deep-yellow flesh tubers that will boil. No entry met these criteria.

9.3.9. Experiments 00PE4 & 01PE10 - Disease screening trials.

Aim

To determine reaction of entries to powdery scab disease and crocodile skin disorder.

Results

Powdery scab

Powdery scab results for both screenings are shown in Table 9.3.9.1. Two entries tested in the fresh demonstrations were shown to be tolerant to powdery scab. These were Carlingford and 96-28-1 (Jayco). A third fresh market variety, 88-71-9 (Kaloorup King) also appears tolerant. This variety was selected by Dawson *et al*. (1998) for the fresh market in 1996 but its disease reaction was not determined.

Crispa was the only entry tested in the crisp demonstrations that was shown to be tolerant to powdery scab. 90-2-6 (Bliss), 91-106-1 (Sonic) and 93-6-3 (Kirkie) produced inconsistent results. 91-1-5 (Wilson) and 95-11-25 (Minilya) were shown to be highly susceptible.

Crocodile skin

Crocodile skin results for both screenings are shown in Table 9.3.9.2.

Nine fresh market entries were shown to have tolerance to crocodile skin, these were Carlingford, Granola, 95-39-8 (Sentosa), 96-23-7 (Coromal), 96-28-5, 96-87-1, 96-134-3 (Roadstar), 96-136-4 (Crusher) and 96-141-13.

Four entries produced inconsistent results: 95-11-25 (Minilya), 96-141-12 (Windsor), 96-28-1 (Jayco) and 96-102-1.

Kaloorup King and 96-88-7 (Franklin) were shown to be susceptible while 96-136-9 (Viscount) was highly susceptible.

91-1-5 (Wilson) and 91-106-1 (Sonic) were the only entries tested in the crisp demonstrations that were shown to be tolerant to crocodile skin. 90-2-6 (Bliss), 93-6-3 (Kirkie) and 95-11-25 (Minilya) produced inconsistent results. Crispa was shown to be highly susceptible.

Table 9.3.9.1. Field tolerance to powdery scab of potato entries in a trial at Baldivis 2000 & 2001.

Entry	Market type if not fresh	Trial				Susceptibility over both screenings
		00PE4		01PE10		
		Severity* score	Susceptibility rating~	Severity* score	Susceptibility rating~	
Carlingford		0.27	tolerant	1.12	tolerant	tolerant
Crispa	crisp	0.11	tolerant	1.87	tolerant	tolerant
Desiree (tolerant control)		0.01	tolerant	1.87	tolerant	tolerant
Granola		0.59	susceptible	1.90	tolerant	?
Kaloorup King		0.07	tolerant	1.46	tolerant	tolerant
Nadine		0.78	highly sus	2.26	tolerant	?
90-2-6 (Bliss)	crisp	0.25	tolerant	2.56	highly susc.	?
91-1-5 (Wilson)	crisp	0.95	highly sus	2.43	highly susc.	highly sus
91-106-1 (Sonic)	crisp	1.22	highly sus	2.23	tolerant	?
93-6-3 (Kirkie)	crisp	0.34	tolerant	2.51	highly susc.	?
95-11-25 (Minilya)	crisp/fresh	0.84	highly sus	2.68	highly susc.	highly sus
95-39-8 (Sentosa)		0.35	tolerant	2.32	susceptible	?
96-4-5		0.46	tolerant	-	-	
96-23-7 (Coromal)		0.52	susceptible	2.60	highly susc.	?
96-28-1 (Jayco)		0.13	tolerant	2.20	tolerant	tolerant
96-28-5		0.70	highly sus	1.74	tolerant	?
96-29-7		0.62	susceptible	-	-	
96-87-1		0.67	highly sus	2.53	highly susc.	highly sus
96-88-7 (Franklin)		0.75	highly sus	2.87	highly susc.	highly sus
96-102-1		0.12	tolerant	2.34	susceptible	?
96-125-31		0.82	highly sus	-	-	
96-125-36		0.06	tolerant	-	-	
96-134-3 (Roadstar)		1.92	highly sus	2.85	highly susc.	highly sus
96-136-4 (Crusher)		2.47	highly sus	2.07	tolerant	?
96-136-9 (Viscount)		0.72	highly sus	1.69	tolerant	?
96-141-12 (Windsor)		0.28	tolerant	2.43	highly susc.	?
96-141-13		1.48	highly sus	2.41	highly susc.	highly sus
Significance+		***		***		
LSD P = 0.05		0.47		0.41		
LSD P = 0.01		0.62		0.54		

* Severity = number of tubers with 0-5% surface covered with disorder + (tubers with 5-25% disorder x 2) + (tubers with >25% disorder x 3) divided by total number of tubers.

~ Rating = tolerant if severity score is not sig. diff (5%) to the tolerant control,
Rating = susceptible if the severity score is sig. greater (1%<P<5%) than the tolerant control,
Rating = highly susceptible if the severity score is highly significantly (P<1%) greater than the control.

Table 9.3.9.2. Field tolerance to crocodile skin of potato entries in a trial at Baldivis 2000 & 2001.

Entry	Market type if not fresh	Trial				Susceptibility over both screenings
		00PE4		01PE10		
		Severity* score	Susceptibility rating~	Severity* score	Susceptibility rating~	
Carlingford		0.07	tolerant	0.04	tolerant	tolerant
Crispa	crisp	2.22	highly sus	0.57	highly susc.	highly susc.
Desiree		2.02	highly sus	0.38	highly susc.	highly susc.
Granola		0.02	tolerant	0.02	tolerant	tolerant
Kaloorup King		1.56	highly sus	0.30	susceptible	susceptible
Nadine (tol control)		0.26	tolerant	0.01	tolerant	tolerant
90-2-6 (Bliss)	crisp	1.69	highly sus	0.24	tolerant	?
91-1-5 (Wilson) crisp	crisp	0.03	tolerant	0.05	tolerant	tolerant
91-106-1 (Sonic)	crisp	0.15	tolerant	0.02	tolerant	tolerant
93-6-3 (Kirkie)	crisp	1.30	highly sus	0.08	tolerant	?
95-11-25 (Minilya)	crisp/fresh	1.15	highly sus	0.08	tolerant	?
95-39-8 (Sentosa)		0.35	tolerant	0.03	tolerant	tolerant
96-4-5		1.35	highly sus	-	-	
96-23-7 (Coromal)		0.06	tolerant	0.01	tolerant	tolerant
96-28-1 (Jayco)		1.18	highly sus	0.12	tolerant	?
96-28-5		0.01	tolerant	0.02	tolerant	tolerant
96-29-7		0.01	tolerant	-	-	
96-87-1		0.25	tolerant	0.03	tolerant	tolerant
96-88-7 (Franklin)		0.78	highly sus	0.29	susceptible	susceptible
96-102-1		1.67	highly sus	0.24	tolerant	?
96-125-31		0.10	tolerant	-	-	
96-125-36		1.45	highly sus	-	-	
96-134-3 (Roadstar)		0.26	tolerant	0.06	tolerant	tolerant
96-136-4 (Crusher)		0.03	tolerant	0.23	tolerant	tolerant
96-136-9 (Viscount)		1.51	highly sus	0.80	highly susc.	highly susc.
96-141-12 (Windsor)		0.62	highly sus	0.04	tolerant	?
96-141-13		0.13	tolerant	0.10	tolerant	tolerant
Significance+		***		***		
LSD P = 0.05		0.26		0.27		
LSD P = 0.01		0.35		0.36		

* Severity = number of tubers with 0-5% surface covered with disorder + (tubers with 5-25% disorder x 2) + (tubers with >25% disorder x 3) divided by total number of tubers.
~ Rating = tolerant if severity score is not sig. diff (5%) to the tolerant control,
Rating = susceptible if the severity score is sig. greater (1%<P<5%) than the tolerant control,
Rating = highly susceptible if the severity score is highly significantly (P<1%) greater than the control.

9.3.10. Selections from the twelfth series of fresh market trials.

Five entries were selected from the demonstrations and just one of these, 96-141-12 (Windsor) was from the "96" series of breeding lines (Table 9.3.10).

Four selections from the previous series were se-selected during this latest series of experiments.

- 95-83-11 (Sandfire) was previously selected for its performance in the May planted demonstration as well as the February planted demonstration (Section 9.2.6). In was not selected in this series' July planted demonstration because of consistent low yield (Section

9.3.7). It was selected in the May planted demonstration on the condition that it was chosen for other planting times as well. This did not occur and so 95-83-11 will not be tested further.

- 95-12-2 (Willare) was previously selected for its performance in a July demonstration (Section 9.2.6). It was not selected in this series it had low yield in the July planted demonstration (Section 9.3.7) and because 95-11-20 (Auski) was better.
- 95-39-8 (Sentosa) was previously selected for its performance in the May planted demonstration at Baldivis (Section 9.2.6). It was not selected in this series due to inconsistent scab results and poor frying results (Section 9.3.6).
- 92-123-7 (Passion) was tested on a small commercial scale by farmers at Manjimup. They found that its yield was consistently lower than their standard varieties.

Table 9.3.10. Entries selected from demonstrations of the twelfth series of fresh market trials.

Entry	Demon-stration	Powdery scab reaction (from Table 9.3.9.1 unless otherwise indicated).	Comments	Re-test?
Carlingford	00MA12	tolerant	Already in commercial tests	ABT*
95-83-11 (Sandfire)	01PE9	tolerant (Table 9.2.5.1)	Selected from previous series also, see section 9.2.6. Selected on proviso that it is commercialised at other times of planting.	yes
	01BU5B		Farmers choice but yield likely to be low	no
89-12-1 (Eureka)	00MA12		Already in commercial tests	ABT
95-11-25 (Auski)	01BU5A 01BU5B	Highly suscept. (Table 9.2.5.1)	Better yield than Sandfire in July plantings.	ABT
96-141-12 (Windsor)	01PE9	inconsistent	Potential for winter French-fry production.	Yes

* ABT = already being tested

9.4 Thirteenth or "97" series of fresh domestic & export market experiments

9.4.1. Background

Breeding lines of the "97" series from the Department of Primary Industries, Victoria, Agriculture division's Potato Breeding Program were tested. Three screenings, four district trials and four demonstrations were completed and are described below.

9.4.2. Experiment 99BU1W - October 1999 planted unreplicated screening at Margaret River.

Aims

1. To select entries suitable for the fresh market in an October planting at Margaret River. The entries comprise 95 "97" series of Australian breeding lines plus 24 yellow fleshed varieties (breeding lines and imports), plus two white fleshed imported varieties and three other earlier series breeding lines selected at the NPIC. These were compared with the following standard varieties; Atlantic, Coliban, Delaware, Desiree, Kennebec, Mondial, Nadine, Ranger Russet, Ruby Lou, Russet Burbank, Shepody and Winter Gem.
2. To provide high quality seed for further tests.

Results

50 entries were classified as fresh domestic market types (Table 9.4.2.1). First selections had suitable tuber characteristics with specific gravity of 1.060 or greater with after-cooking-darkening and sloughing both less than 4 and fry colour lighter than 8. Second selections had questionable tuber characteristics with specific gravity of 1.060 or greater and, if data were available, after-cooking-darkening and sloughing both less than 3 and fry colour lighter than 7. All selections are shown in bold typeface in Table 9.4.2.1. 23 selections were made for further testing in next season's replicated screening. 97-25-5 did not produce enough seed to allow replanting in the replicated screening and so this will be re-tested in next season's unreplicated screening.

Thirteen entries were classified as fresh export market types (Table 9.4.2.2). Selections had suitable tuber characteristics which included the requirement of yellow flesh. The nine selections for further testing in next season's replicated screening are shown in bold typeface in Table 9.4.2.2. Two of these selections, Maris Piper and 92-27-3 were also chosen for the domestic market while Yukon Gold was also selected for the crisp market.

These selections will be re-tested next season in a replicated screening. They will be tested with additional selections that will be made from the following May planted winter screening (see next section).

Table 9.4.2.1. Tuber characteristics, yield and quality of fresh domestic market potato breeding lines in an October 1999 planted unreplicated screening at Margaret River. Selections in **bold** typeface.

Entry	Tuber* charact-eristics	SG	Yield >80g (t/ha)	Cook tests (NPIC 1999)			Final selection & notes
				Crisp# colour	Boil+ ACD	Boil+ Slough	
Coliban	**yes**	**1.063**	**36.1**	**5-8**	**1**	**3**	**Yes standard**
Delaware	**no**	**1.065**	**62.5**	**-**	**-**	**-**	**Standard**
Desiree	no	1.068	55.4	4	1-3	1	No unsuitable tub char
Kennebec	?	1.066	49.1	-	-	-	No obsolete standard
King Edward	no	1.068	26.7	-	-	-	No unsuitable tub char
Maris Piper	**yes**	**1.075**	**40.7**	**-**	**-**	**-**	**Yes**
Mondial	**?**	**1.058**	**37.1**	**-**	**-**	**-**	**Yes yellow standard**
Nadine	**yes**	**1.043**	**33.7**	**-**	**-**	**-**	**Standard despite low SG**
Red Rascal	**?**	**1.073**	**46.2**	**-**	**-**	**-**	**Yes**
Ruby Lou	**yes**	**1.063**	**56.1**	**-**	**-**	**-**	**Yes red standard**
Winter Gem	**yes**	**1.052**	**40.4**	**-**	**-**	**-**	**Yes new winter variety**
87-12-6	no	1.055	5.4	-	-	-	No unsuitable tub char
89-88-3	**yes**	**1.074**	**18.7**	**-**	**-**	**-**	**Yes**
92-27-3	**yes**	**1.066**	**53.4**	**-**	**-**	**-**	**Yes**
95-37-12	**?**	**1.068**	**33.2**	**-**	**-**	**-**	**Yes**
96-29-21	?	1.042	7.1	-	-	-	No low SG
97-9-10	**yes**	**1.057**	**37.6**	**7**	**2**	**1**	**Yes**
97-9-14	no	-	-	-	-	-	No unsuitable tub char
97-11-7	no	-	-	-	-	-	No unsuitable tub char
97-11-18	?	1.063	28.9	6	3	1	No bad ACD
97-11-19	?	1.058	35.0	7	1	3	No fry colour too dark
97-12-9	**yes**	**1.062**	**30.9**	**6**	**1**	**2**	**Yes**
97-15-1	?	1.067	21.2	5	1	3	No bad slough
97-23-6	no	-	-	-	-	-	No unsuitable tub char
97-24-6	**yes**	**1.059**	**46.4**	**6**	**2**	**1**	**Yes**
97-25-5	**yes**	**1.058**	**9.5**	**6**	**2**	**3**	**Yes**
97-26-2	**yes**	**1.069**	**34.1**	**5**	**1**	**1**	**Yes**
97-38-2	no	-	-	-	-	-	No unsuitable tub char
97-38-3	no	-	-	-	-	-	No unsuitable tub char
97-39-8	**yes**	**1.069**	**13.9**	**5**	**1**	**3**	**Yes**
97-47-3	**?**	**1.065**	**26.6**	**3**	**2**	**1**	**Yes**
97-47-6	**?**	**1.065**	**23.2**	**5**	**2**	**1**	**Yes**
97-47-16	no	-	-	-	-	-	No unsuitable tub char
97-48-5	?	1.074	43.8	7	1	1	No fry colour too dark
97-52-7	?	1.058	27.6	6	1	1	No SG too low
97-54-1	?	1.061	71.8	6	3	3	No bad slough
97-64-1	**yes**	**1.065**	**21.3**	**5**	**1**	**2**	**Yes**
97-66-1	no	-	-	-	-	-	No unsuitable tub char
97-67-12	no	-	-	-	-	-	No unsuitable tub char
97-71-3	yes	1.065	60.1	5	1	5	No bad slough
97-86-55	no	-	-	-	-	-	No unsuitable tub char
97-89-5	**yes**	**1.071**	**31.4**	**5**	**2**	**1**	**Yes**
97-90-2	**yes**	**1.062**	**30.5**	**6**	**1**	**1**	**Yes**
97-90-4	?	1.064	26.2	4	1	3	No bad slough
97-91-4	?	1.085	43.7	5	3	3	No bad ACD
97-91-6	?	1.069	36.3	4	4	2	No bad ACD
97-97-4	yes	1.063	35.1	5	4	1	No bad ACD
97-101-8	no	-	-	-	-	-	No unsuitable tub char
97-102-1	**yes**	**1.065**	**28.7**	**5**	**1**	**2**	**Yes**
97-102-7	yes	1.074	54.1	6	2	5	No bad slough

*Tuber characteristics (tc); yes = suitable, ? = questionable, no = unsuitable

Crisp colour; scale 1 - 10 (light to dark), >7 unacceptable for French-fries.

+Boiling: ACD (after-cooking-darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy

Table 9.4.2.2. Tuber characteristics, yield and quality of fresh export market potato breeding lines in an October 1999 planted unreplicated screening at Margaret River. Selections in **bold** typeface.

Entry	Tuber* charact-eristics	SG	Yield >80g (t/ha)	Cook tests (NPIC 1999)			Final selection & notes
				Crisp# colour	Boil+		
					ACD	Slough	
Clone 87	?	1.085	38.3	-	-	-	No questionable tuber char's
Geographe	?	1.060	51.3	-	-	-	No questionable tuber char's
Maris Piper	**yes**	**1.075**	**40.7**	-	-	-	**Yes (also domestic selection)**
Mondial	**?**	**1.058**	**37.1**	**-**	**-**	**-**	**Yes standard**
Saginaw Gold	**yes**	**1.059**	**22.2**	-	-	-	**Yes**
Yukon Gold	**yes**	**1.066**	**35.4**	-	-	-	**Yes (also crisp selection)**
92-27-3	**yes**	**1.066**	**53.4**	-	-	-	**Yes (also domestic selection)**
97-1-5	**yes**	**1.053**	**20.7**	**6**	**1**	**1**	**Yes**
97-52-3	?	1.053	8.6	7	1	1	No questionable tuber char's
97-85-3	?	1.065	68.9	4	2	2	No questionable tuber char's
97-86-20	**yes**	**1.061**	**58.3**	**7**	**1**	**3**	**Yes**
97-86-35	**yes**	**1.061**	**47.2**	**5**	**1**	**3**	**Yes**
97-86-46	**yes**	**1.059**	**33.0**	**5**	**2**	**1**	**Yes**

*Tuber characteristics (tc); yes = suitable, ? = questionable, no = unsuitable
Crisp colour; scale 1 - 10 (light to dark), >7 unacceptable for French-fries.
+Boiling: ACD (after-cooking-darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy

9.4.3. Experiment 00PE1 - May 2000 planted unreplicated screening at Baldivis.

Aims

To select entries suitable for the fresh market in a May planting at Baldivis near Perth from the "97" series of breeding lines selected at the NPIC and other varieties described for Experiment 99BU1 (see previous section).

Domestic fresh market selections

30 entries were classified as fresh market types (Table 9.4.3.1). To be selected entries had to have suitable tuber characteristics with crisp colour (fry score) better than 8 and after-cooking-darkening and slough scores better than 3. The four selections were Maris Piper, 97-38-2, 97-38-3, 97-39-8 (also selected in summer for the fresh market) and 97-74-3. These are shown in bold in Table 9.4.3.

Export fresh market selections

Four entries were classified as export fresh market types (Table 9.4.3.2). To be selected entries had to have suitable tuber characteristics (including yellow flesh) with crisp colour (fry score) better than 8 and after-cooking-darkening and slough scores better than 3. The two selections were Yukon Gold {already selected as a summer crisp (Experiment 99BU1C Section 5.3.2) and summer export (see previous section)} and 97-86-35 (already selected as a summer export variety – see previous section). These selections are highlighted in bold in Table 9.4.3.2.

Selections for further testing from both summer and winter unreplicated screenings are shown in Table 9.4.4.

Table 9.4.3.1. Quality and yield of domestic fresh market potato breeding lines in a May 2000 planted unreplicated screening at Baldivis. Selections shown in bold.

Entry	Tuber* charact-eristics	SG	Yield >80g (t/ha)	Cooking tests			Flesh faults (%)	Final selection & notes
				Crisp# colour	Boil+ ACD	Boil+ Slough		
Coliban	?	1.065	37	8	1	1	0	Yes, standard.
Delaware	no	1.067	40	8	2	2	0	Yes, standard.
Desiree	?	1.069	42	4	1	1	0	No.
Kennebec	no	-	-	-	-	-	-	No tub char unsuitable.
Maris Piper	**yes**	**1.071**	**44**	**7**	**1**	**2**	**0**	**Yes.**
Mondial	no	1.058	55	9	1	2	0	No tub char unsuitable.
Nadine	yes	1.051	46	10	1	1	0	Yes, standard.
Ruby Lou	**yes**	**1.071**	**55**	**6**	**1**	**1**	**10**	**Yes, standard red.**
Winter Gem	**yes**	**1.062**	**40**	**6**	**2**	**2**	**0**	**Yes, new winter stand..**
95-102-20	?	1.078	64	7	1	2	20	No, ? tub char.
97-9-10	yes	1.061	45	8	1	2	0	No, fry colour too dark.
97-11-7	?	1.067	34	8	2	1	0	No, fry colour too dark.
97-24-6	?	1.075	39	7	2	3	0	No, slough too great.
97-38-2	**yes**	**1.065**	**50**	**5**	**1**	**1**	**0**	**Yes.**
97-38-3	**yes**	**1.059**	**64**	**6**	**1**	**1**	**10**	**Yes.**
97-39-8	**yes**	**1.075**	**50**	**7**	**1**	**2**	**0**	**Yes.**
97-47-6	?	1.071	41	6	1	1	20	No, ? tub char.
97-54-1	yes	1.071	54	7	2	4	60	No, slough too great.
97-63-6	?	1.071	56	8	2	3	10	No, fry colour too dark.
97-74-3	**yes**	**1.086**	**37**	**6**	**2**	**2**	**0**	**Yes.**
97-77-8	?	1.064	58	6	2	2	10	No, ? tub char.
97-86-38	yes	1.083	46	8	1	2	0	No, fry colour too dark.
97-86-46	?	1.066	59	8	1	1	0	No, fry colour too dark.
97-86-47	?	1.073	53	8	2	2	0	No, fry colour too dark.
97-86-55	no	-	-	-	-	-	-	No tub char unsuitable.
97-90-2	?	1.079	38	6	1	3	0	No, slough too great.
97-91-6	yes	1.077	53	5	2	4	0	No, slough too great.
97-91-7	yes	1.079	0	7	3	3	0	No, ACD & slough too great.
97-91-11	?	1.083	52	5	2	2	0	No, ? tuber char.
97-105-28	yes	1.080	53	6	1	4	10	No, slough too great.

*Tuber characteristics; Yes = suitable, ? = questionable, no = unsuitable
#Crisp colour: 1-10, >7 too dark
+Boiling: ACD (after-cooking-darkening): 1 = nil, 3 = moderate, 5=general blackening
Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy

Table 9.4.3.2. Quality and yield of export fresh market potato breeding lines in a May 2000 planted unreplicated screening at Baldivis. Selections shown in bold.

Entry	Tuber* charact-eristics	SG	Yield >80g (t/ha)	Cooking tests			Flesh faults (%)	Final selection & notes
				Crisp# colour	Boil+ ACD	Boil+ Slough		
Geographe	?	1.064	43	8	1	2	0	No ? tub. char.
Yukon Gold	**yes**	**1.077**	**36**	**6**	**1**	**3**	**0**	**Yes**
95-102-20	?	1.078	64	7	1	2	20	No ? tub. char.
97-86-35	**yes**	**1.063**	**52**	**6**	**1**	**2**	**0**	**Yes**

*, #, + see key below previous table.

9.4.4. Experiment 00BU2 – November 2000 planted replicated screening at Margaret River.

Background

This screening combined breeding lines selected for crisp, French-fry and export markets. Some entries shown in Table 9.4.4 do not appear in the previous fresh market screenings as they were selected from the crisp stream (see Sections 5.3.2 & 5.3.3).

Aims

1. To bulk seed of the lines selected in the previous screenings.
2. To apply further selection pressure to reduce the number to be tested in district trials. The additional selection pressure can only be applied to summer selections. Entries which have been selected for their winter performance will be tested in district trials without regard for their performance in this summer screening.

Results

Yield and quality data are shown in Table 9.4.4.1 and Table 9.4.4.2.

Domestic fresh market

Of the 51 entries 32 were categorised as domestic fresh market types. Selections had suitable tuber characteristics, specific gravity significantly greater than Nadine (≥ 1.058) with fry colour less than 8, after-cooking-darkening and slough not significantly greater than Delaware (4 and 2.8 respectively) with internal disorders not significantly greater than Delaware. Coloured varieties had to pass a skinning test. If tuber characteristics were questionable then entries were selected if they met all other requirements though fry colour had to be less than 7. Selections were; Coliban, Maris Piper, Mondial, Red Rascal, 95-37-12, 97-1-5, 97-9-10, 97-12-9, 97-24-1, 97-39-8, 97-47-6, 97-64-1, 97-86-20, 97-86-35, 97-86-46 and 97-102-1. This last entry was also selected for French-fry testing (see Section 7.3.4).

Two other entries were selected even though they did not meet the selection criteria. These were 97-85-3 (which was selected by a WA industry representative at the NPIC) and 92-27-3, which, despite having 50% fleck, performed well in all other characteristics.

Export fresh market

Of the 51 entries 8 were categorised as domestic fresh market types. Selections had suitable tuber characteristics, dark yellow flesh, specific gravity significantly greater than Nadine (≥ 1.058) with fry colour less than 8, after-cooking-darkening and slough not significantly greater than Delaware (4 and 2.8 respectively) with internal disorders not significantly greater than Delaware. Selections were Yukon Gold and 97-86-35.

Winter selections

Winter performance must be considered when selecting material for district trials. Additional selections from the winter screening (see previous section) which will also be tested in district trials are Maris Piper (also selected in summer), Yukon Gold (also selected in summer), 97-38-2, 97-38-3, 97-39-8 (also selected in summer), 97-74-3 (also selected as a summer crisp, see Section 5.3.4) and 97-86-35 (also selected in summer).

All selections will be tested in district trials next season with selections from the winter screening.

Table 9.4.4.1. Yield and quality of domestic fresh market (white fleshed) entries in a November 2000 planted replicated screening at Margaret River.

Planted: 3 November 2000 Harvested: 21 March 2001 Soil type: sandy loam
Row spacing: 76 cm Soil temp. at harvest: 16°C Elevation: 100 m

Entry, *tuber characteristics and spacing (cm)		Yield (t/ha)						Rank by Grade No.1	Tuber no. per plant	Quality			
		Chats 0-70g	Small 70-120g	Med-ium 120-350g	Large 350-450g	Grade No. 1 70-450g	Over size >450g			SG	ACD §	Slough ~	Fry# colour
Coliban	15	5.4	14.1	55.9	0.4	70.4	0.0	6	6.2	1.065	3.3	2.0	5.0
Delaware	15	3.4	9.7	65.5	4.0	79.2	0.5	2	6.3	1.075	2.5	1.8	7.0
Maris Piper	24	10.8	30.5	27.1	0.0	57.6	0.0	23	14.6	1.080	1.8	2.3	4.5
Mondial	15	9.9	24.1	66.3	0.4	90.8	0.9	1	10.9	1.065	2.8	1.0	7.5
Nadine	24	9.5	17.4	50.4	1.1	68.8	0.5	8	14.8	1.052	1.3	1.0	9.0
Red Rascal	24	10.3	25.4	41.1	0.0	66.4	0.0	10	14.5	1.074	1.3	1.3	5.0
Ruby Lou	20	7.8	14.6	51.2	0.0	65.9	0.0	11	9.9	1.067	2.8	1.3	4.5
Winter Gem	20	14.0	22.7	26.2	0.0	48.9	0.0	29	13.8	1.056	3.8	1.3	7.0
89-88-3	24	4.4	10.3	30.9	0.4	41.5	0.0	31	8.0	1.077	2.0	2.8	5.5
92-27-3	24	5.6	8.3	50.6	2.4	61.3	0.0	15	9.2	1.071	2.8	1.3	5.5
95-37-12	24	3.1	13.6	42.3	2.1	58.1	1.0	21	8.6	1.070	2.8	1.0	5.0
97-1-5	30	4.1	17.0	52.5	0.8	70.3	0.0	7	12.6	1.061	1.3	1.0	6.0
97-9-10	24	4.7	9.5	33.8	10.0	53.3	3.1	26	8.3	1.062	3.0	1.5	6.5
97-10-6	24	12.4	15.5	24.9	0.0	40.4	0.0	32	11.3	1.087	2.5	3.0	4.5
97-12-9	24	3.7	15.2	43.3	0.4	58.9	0.0	20	9.3	1.070	2.3	1.5	5.5
97-24-1	30	5.5	11.1	37.6	0.3	49.0	0.0	28	11.6	1.083	3.3	1.5	5.5
97-24-6	24	3.7	12.0	48.4	0.0	60.4	0.0	16	9.1	1.062	4.8	1.3	5.0
97-26-2	24	5.6	6.6	40.1	3.6	50.2	0.0	27	10.1	1.073	3.0	1.5	5.5
97-38-3	24	5.3	13.7	59.6	2.3	75.5	0.0	3	11.2	1.063	2.0	1.0	5.5
97-39-8	30	2.2	5.9	48.3	3.7	57.9	1.4	22	9.5	1.072	2.3	2.5	4.0
97-47-6	24	0.7	4.3	31.6	0.0	35.9	0.0	33	4.3	1.070	1.8	1.0	5.5
97-59-21	24	8.1	13.1	39.8	1.5	54.3	0.0	24	11.2	1.066	2.0	1.8	4.5
97-64-1	24	2.3	7.3	25.8	0.8	33.9	0.0	34	5.0	1.069	2.8	1.3	4.5
97-83-13	24	2.1	4.3	45.0	9.7	59.1	12.9	18	6.4	1.087	5.0	2.5	4.0
97-85-3 (HHR)													
97-86-20	24	4.1	8.6	59.4	6.1	74.2	0.0	4	10.8	1.067	2.3	2.5	6.5
97-86-35	24	5.5	11.3	45.8	2.7	59.8	0.0	17	7.5	1.063	2.5	2.0	5.5
97-86-46	24	2.6	9.4	49.0	5.4	63.9	3.7	13	8.0	1.072	2.8	1.8	7.0
97-89-5	24	6.4	16.8	46.9	0.8	64.5	0.0	12	11.7	1.081	4.0	1.0	5.5
97-90-2	24	1.5	5.1	46.2	7.7	59.0	0.0	19	6.3	1.073	4.0	2.0	5.0
97-102-1	24	1.6	6.9	49.1	12.6	68.6	4.3	9	7.6	1.076	3.3	1.8	6.0
97-105-28	30	5.5	8.1	23.0	0.0	31.1	0.4	35	12.2	1.071	3.3	1.8	5.5
Significance+		***	***	***	skew	***	skew		***	***	***	**	***
LSD P = 0.05		2.9	6.2	15.6		14.8			2.1	0.006	1.5	1.0	1.8

***** Tuber characteristics: **bold** typeface = suitable, plain type = questionable, *italic* = unsuitable.
§ ACD (after-cooking-darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
~ Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy.
# Samples assessed visually: 1 - 10, 6 = borderline, >6 = too dark.
+ "skew" indicates data did not fulfil assumptions of analysis of variance.

Table 9.4.4.2. Yield and quality of fresh export market (yellow fleshed) entries in a November 2000 planted replicated screening at Margaret River.

Planted: 3 November 2000 Harvested: 21 March 2001 Soil type: sandy loam
Row spacing: 76 cm Soil temp. at harvest: 16°C Elevation: 100 m

Entry, *tuber characteristics and spacing (cm)		Yield (t/ha)						Rank by Grade No.1	Tuber no. per plant	Quality			
		Chats 0-70g	Small 70-120g	Med-ium 120-350g	Large 350-450g	Grade No. 1 70-450g	Over size >450g			SG	ACD §	Slough ~	Fry# colour
Mondial	15	9.9	9.9	66.3	0.4	76.6	0.9	2	10.9	1.065	2.8	1.0	7.5
Saginaw Gold	24	2.6	9.9	38.6	0.0	48.4	0.0	20	7.2	1.066	3.0	1.8	5.0
Yukon Gold	24	3.9	11.6	41.7	0.0	53.3	0.0	15	8.3	1.067	1.0	1.0	6.0
89-88-3	24	4.4	10.3	30.9	0.4	41.5	0.0	23	8.0	1.077	2.0	2.8	5.5
95-37-12	24	3.1	13.6	42.3	2.1	58.1	1.0	12	8.6	1.070	2.8	1.0	5.0
97-86-20	24	4.1	8.6	59.4	6.1	74.2	0.0	5	10.8	1.067	2.3	2.5	6.5
97-86-35	24	5.5	11.3	45.8	2.7	59.8	0.0	11	9.2	1.063	2.5	2.0	5.5
97-86-46	24	2.6	9.4	49.0	5.4	63.9	3.7	8	8.0	1.072	2.8	1.8	7.0
Significance+		***	***	***	skew	***	skew		***	***	*	***	*
LSD P = 0.05		3.3	7.9	16.5		16.1			2.3	0.007	1.8	1.0	2.0

* Tuber characteristics: **bold** typeface = suitable, plain type = questionable, *italic* = unsuitable.
§ ACD (after-cooking-darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
~ Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy.
# Samples assessed visually: 1 - 10, 6 = borderline, >6 = too dark.
+ "skew" indicates data did not fulfil assumptions of analysis of variance.

9.4.5. Experiment 01PE8 – May planted district trial at Mandogalup.

Aim

To select entries suited to fresh market production from a May planting. Early maturing, high yielding varieties that produce attractive, large tubers with versatile cooking quality under cold conditions are required.

Results

Yield and quality data are shown in Table 9.4.5. Tuber characteristics should be suitable, specific gravity should not be significantly less than Delaware (i.e. > 1.063), after-cooking-darkening and slough should be moderate or better and fry colour should be acceptable. Yield should not be significantly less than Delaware (or Ruby Lou for reds) at the 1% level. For May plantings varieties should also have tolerance to powdery scab. Entries which are highly susceptible to powdery scab should not be selected. Selections were Maris Piper (despite dark fry colour), Red Rascal (despite low yield), 97-38-2 (White Star), 97-47-6 (despite yield), 97-64-1, 97-74-3 (despite yield) and 97-86-20.

Table 9.4.5. Yield and quality of fresh market entries in a May 2001 planted district trial at Mandogalup.

Planted: 22 May 2001 Harvested: 24 October 2001 Soil type: alkaline sand
Row spacing: 72 cm Soil temp. at harvest: 19°C Elevation: 20 m

Entry tuber* characteristics & spacing in rows (cm)		Yield (t/ha)						Rank by Grade No.1	Tuber no. per plant	Quality				
		Chats 0-70g	Small 70-120g	Med-ium 120-350g	Large 350-450g	Grade No. 1 70-450g	Over size >450g			SG	ACD §	Slou-gh ing~	Fry# color	Pwd scab tol†
Coliban	15	3.9	10.3	30.2	0.0	40.4	0.0	24	4.9	1.068	1.0	1.2	7.7	
Delaware	24	6.1	12.3	41.6	0.8	54.7	0.3	9	8.2	1.065	1.2	2.0	6.3	
Maris Piper	24	5.1	16.6	40.7	0.0	57.4	0.0	3	9.6	1.073	1.2	1.8	7.7	tol
Mondial	15	3.4	7.9	45.6	11.8	65.3	2.8	1	5.3	1.062	1.3	1.0	8.0	
Nadine	24	12.9	19.3	30.6	0.0	49.9	0.0	13	10.9	1.054	1.0	1.2	9.0	tol
Red Rascal	24	6.4	15.2	30.4	1.5	47.1	0.0	17	9.2	1.069	1.2	1.0	6.3	tol
Ruby Lou	20	6.6	13.5	38.8	2.8	55.1	0.3	8	7.7	1.077	1.3	1.5	5.0	
Saginaw Gold	30	2.4	13.4	29.6	0.0	43.0	0.0	21	7.9	1.075	1.2	2.7	5.3	tol
Winter Gem	20	7.7	15.8	36.6	1.0	53.4	0.0	11	8.4	1.067	1.3	1.8	6.0	
Yukon Gold	24	3.5	7.2	30.4	0.0	37.7	0.0	27	6.0	1.074	1.0	2.2	6.3	h sus
89-88-3	24	5.6	13.0	15.9	0.0	28.9	0.0	30	7.4	1.082	1.3	2.2	5.3	h sus
92-27-3	30	3.2	9.0	27.9	0.5	37.4	0.0	28	7.8	1.076	1.0	1.2	6.3	tol
95-37-12	24	4.3	9.8	30.4	0.0	40.2	0.0	25	7.3	1.069	1.2	1.0	5.7	h sus
97-1-5	30	3.0	10.6	30.2	0.0	40.8	0.0	23	8.7	1.066	1.0	1.2	6.0	h sus
97-9-10	24	4.0	11.6	43.8	0.0	55.5	0.0	5	8.7	1.064	1.2	1.2	7.3	h sus
97-10-6	30	10.2	13.5	21.4	0.0	34.9	0.0	29	12.1	1.080	1.8	2.7	5.7	
97-12-9	24	2.6	8.2	45.4	1.5	55.1	0.0	7	6.7	1.064	1.0	1.0	7.7	h sus
97-24-1	30	13.3	13.6	5.4	0.0	19.0	0.0	32	8.6	1.085	1.2	1.0	6.0	sus
97-38-2	30	2.6	5.2	51.0	0.6	56.9	0.3	4	8.6	1.071	1.0	1.0	4.3	tol
97-38-3	24	6.0	12.2	50.7	0.0	62.9	0.0	2	10.3	1.062	1.2	1.0	6.0	h sus
97-39-8	24	4.9	11.5	40.5	0.2	52.2	0.0	12	8.2	1.075	1.2	2.3	6.7	h sus
97-47-3	24	2.3	6.7	31.0	0.5	38.1	0.0	26	5.1	1.095	1.8	1.8	4.0	h sus
97-47-6	24	2.3	7.3	35.9	0.0	43.2	0.0	20	6.8	1.074	1.7	1.0	6.7	tol
97-64-1	24	2.9	10.5	37.3	0.4	48.3	0.0	16	6.9	1.071	1.8	2.2	5.7	tol
97-74-3	24	12.7	24.2	17.1	0.0	41.3	0.0	22	11.8	1.085	1.7	2.2	5.0	tol
97-84-6	24	9.1	18.7	26.6	0.0	45.3	0.0	18	10.6	1.085	2.0	1.7	4.3	h sus
97-85-3 HHR	24	9.0	16.7	27.0	0.0	43.6	0.0	19	11.2	1.071	1.3	2.7	7.0	tol
97-86-20	24	2.6	6.0	39.9	3.5	49.3	0.0	14	7.2	1.068	1.0	1.7	6.7	tol
97-86-35	24	4.7	10.5	38.2	0.0	48.7	0.0	15	8.1	1.066	1.0	1.3	6.3	h sus
97-86-46 ††	24	2.6	6.5	47.8	1.0	55.3	0.0	6	6.7	1.069	1.2	1.2	6.7	sus
97-102-1	24	3.8	12.1	41.6	0.5	54.2	0.3	10	7.8	1.082	1.8	2.5	5.3	h sus
97-105-30	24	10.6	13.3	5.8	0.0	19.2	0.0	31	6.6	1.088	1.5	4.3	2.7	tol
Significance+		***	***	***	skew	***	skew		***	***	skew	skew	***	
LSD P = 0.05		2.0	3.3	6.5		5.5			1.2	0.003			1.2	
LSD P = 0.01					7.3									

* Tuber characteristics: **bold** typeface = suitable, plain type = questionable, *italic* = unsuitable.
§ ACD (after-cooking-darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
~ Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy.
# Samples assessed visually after crisping: 1 - 10, 7 = borderline, >7 = too dark for domestic French-fries.
† Powdery scab reaction. Data from disease screening (Section 9.4.12).
+ "skew" indicates data did not fulfil assumptions of analysis of variance.
†† *hollows*

9.4.6. Experiments 01BU4A & B - July 2001 & January 2002 planted district trials at Jindong.

Aim

To select fresh market entries suited for fresh production from the double cropping system used on the Swan Coastal Plain. Entries were tested in a pair of trials; the first was planted in July. When this trial was harvested in December cutting seed was saved for the second trial which was planted in January. The aim is to select entries that are suited to one or both times of planting. High yielding, attractive varieties with versatile cooking quality are needed.

Results

July selections

Yield and quality data are shown in Table 9.4.6.1. The trial grew well with most entries having high emergence rates.

For white skinned potatoes, selections had suitable tuber characteristics, specific gravity greater than 1.066 (not significantly less than Delaware), yield greater than 60.1 t/ha (not highly significantly less than Delaware) with after-cooking-darkening and sloughing less than 3. Fry colour had to be acceptable (less than 7). Entries had to be free of major faults. White skinned selections were Eureka and 97-38-2. An exception was 97-38-3 which was selected despite unsuitable tuber characteristics because it had high yield.

For red skinned potatoes the same selection criteria were used except yield had to be greater than 46.1 t/ha (not highly significantly less than Ruby Lou). The sole red skinned selection was Red Rascal.

Export selections had to have high yield and dark yellow flesh. None met these criteria.

January selections

Yield and quality data are shown in Table 9.4.6.2. The trial died early due to lack of water.

If tuber characteristics were suitable, specific gravity should be not significantly less than Delaware (i.e. > 1.063), after-cooking-darkening and slough should be not significantly greater than Delaware, fry colour should be not significantly darker than Delaware and yield should be not highly significantly less than Delaware (for white skinned entries) and Ruby Lou (for reds). Selections were Coliban, 95-37-12, 97-12-9, 97-86-20 and Red Rascal.

Overall selections

White skinned entries selected in either trials were Coliban (January planting), Eureka (July planting) 95-37-12 (January), 97-38-2 (July), 97-38-3 (July), 97-12-9 (January) and 97-86-20 (January).

The only red skinned entry selected in either trial was Red Rascal which was chosen in both plantings.

Table 9.4.6.1. Yield and quality of fresh market entries in a July 2001 planted district trial at Jindong.

Planted: 27 July 2001 Harvested: 12 December 2001 Soil type: sandy loam
Row spacing: 75 cm Soil temp. at harvest: 15°C Elevation: 40 m

Entry tuber* characteristics & spacing in rows (cm)		Yield (t/ha)						Rank by Grade No.1	Tuber no. per plant	Quality			
		Chats 0-70g	Small 70-120g	Medium 120-350g	Large 350-450g	Grade No. 1 70-450g	Oversize >450g			SG	ACD §	Sloughing~	Fry# color
Coliban	15	3.5	11.5	41.4	0.5	53.4	0.0	14	6.1	1.073	1.2	1.2	6.7
Delaware	24	5.5	22.7	49.1	0.0	71.8	0.0	2	12.2	1.070	1.3	1.3	5.7
Eureka	20	2.4	15.4	45.0	0.8	61.2	1.3	5	9.0	1.080	2.5	2.3	4.3
Maris Piper	24	13.6	36.6	20.4	0.0	57.0	0.0	9	15.0	1.080	1.3	1.8	5.3
Mondial	15	3.3	14.8	58.9	3.7	77.4	0.4	1	6.4	1.068	1.5	1.5	7.7
Nadine	24	4.0	13.2	47.5	0.0	60.7	0.7	6	9.1	1.056	1.2	1.2	9.0
Red Rascal	24	2.6	9.2	45.0	0.0	54.2	0.6	12	8.3	1.076	1.5	1.0	6.0
Ruby Lou	20	6.5	18.2	39.3	0.3	57.8	0.8	8	8.9	1.078	1.3	1.3	4.3
Saginaw Gold	30	2.3	15.1	33.1	0.0	48.2	0.0	20	9.5	1.080	2.2	2.5	5.0
Yukon Gold	24	2.9	8.8	36.4	0.7	45.9	0.0	24	7.1	1.080	1.0	2.5	5.7
89-88-3	24	5.5	12.9	21.3	0.0	34.3	0.0	29	9.1	1.085	1.8	2.0	6.3
92-27-3	30	2.7	14.6	25.8	0.0	40.4	0.3	27	8.7	1.079	1.2	1.3	7.0
95-37-12	24	2.7	13.7	39.5	0.5	53.7	0.0	13	8.6	1.074	1.2	1.0	6.0
97-1-5	30	2.4	14.8	39.5	0.0	54.3	0.0	11	10.2	1.073	1.0	1.5	6.3
97-9-10	20	4.7	14.7	38.7	0.0	53.4	0.0	15	7.9	1.075	1.3	1.5	5.3
97-12-9	24	1.3	1.3	46.5	0.4	48.1	0.0	21	7.0	1.073	1.3	1.5	7.7
97-24-1	30	14.1	14.1	8.7	0.0	22.8	0.0	31	14.1	1.086	1.0	1.2	6.3
97-38-2	24	1.6	7.1	56.1	0.0	63.2	0.0	4	8.0	1.070	1.7	1.2	4.3
97-38-3	24	4.0	15.2	55.2	0.0	70.4	0.0	3	11.4	1.072	1.0	1.0	5.7
97-39-8	30	1.9	9.5	28.9	0.0	38.4	0.0	28	8.6	1.083	2.0	2.8	6.7
97-47-3	24	1.0	9.7	33.8	0.0	43.5	0.0	26	5.9	1.085	1.3	1.5	5.3
97-47-6	24	1.3	9.4	38.9	0.0	48.3	0.0	19	7.1	1.078	2.0	1.0	7.3
97-64-1	24	2.7	12.3	37.3	0.5	50.1	0.0	17	7.8	1.076	1.7	1.5	4.7
97-74-3	24	11.3	24.1	21.1	0.0	45.2	0.0	25	11.8	1.091	2.0	2.0	4.3
97-84-16	24	12.5	25.0	22.4	0.0	47.4	0.0	23	12.6	1.084	2.3	3.3	4.3
97-85-3	24	9.3	24.4	26.4	0.3	51.0	0.0	16	12.3	1.080	1.7	2.0	6.7
97-86-20	24	1.7	6.6	49.6	1.8	58.0	0.0	7	7.2	1.074	1.5	2.0	7.7
97-86-35	24	2.0	8.2	38.0	2.5	48.7	0.0	18	7.7	1.072	1.2	1.3	7.0
97-86-46	24	1.6	5.8	41.7	0.0	47.5	0.0	22	7.6	1.072	1.5	1.2	7.3
97-102-1	20	1.0	5.9	45.6	3.7	55.2	3.7	10	7.0	1.081	2.0	1.8	4.7
97-105-30	20	5.8	17.2	14.9	0.0	32.1	0.0	30	7.1	1.087	2.5	3.2	4.0
Significance+		skew	***	***	skew	***	skew		***	***	***	skew	**
LSD P = 0.05			5.1	10.6		8.8			1.2	0.004	0.5		2.1
LSD P = 0.01						11.7							

***** Tuber characteristics: **bold** typeface = suitable, plain type = questionable, *italic* = unsuitable.
§ ACD (after-cooking-darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
~ Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy.
# Samples assessed visually after crisping: 1 - 10, 7 = borderline, >7 = too dark for domestic French-fries.
+ "skew" indicates data did not fulfil assumptions of analysis of variance.

Table 9.4.6.2. Yield and quality of fresh market entries in a January 2002 planted district trial at Jindong.

Planted: 25 January 2002 Harvested: 28 May 2002 Soil type: sandy loam
Row spacing: 75 cm Soil temp. at harvest: 10°C Elevation: 40 m

Entry tuber* characteristics & spacing in rows	(cm)	Yield (t/ha) Chats 0-70g	Small 70-120g	Medium 120-350g	Large 350-450g	Grade No. 1 70-450g	Oversize >450g	Rank by Grade No.1	Tuber no. per plant	Quality SG	ACD §	Sloughing~	Fry# color
Coliban	15	2.2	6.9	39.3	0.7	46.8	0.0	6	4.2	1.068	2.7	1.5	7.0
Delaware	20	2.9	15.4	35.1	0.2	50.7	0.0	4	7.2	1.066	2.3	1.2	7.0
Eureka	20	5.3	16.1	27.6	0.0	43.7	0.0	9	7.5	1.080	3.8	3.0	5.7
Maris Piper	30	7.4	14.5	15.3	0.5	30.4	0.7	22	10.2	1.077	2.3	2.2	5.3
Mondial	15	2.3	8.6	44.5	1.0	54.1	0.0	3	5.6	1.060	1.7	1.3	7.3
Nadine	20	6.6	16.4	16.9	0.2	33.6	0.0	19	8.4	1.056	1.2	1.0	9.0
Red Rascal	24	4.9	16.6	30.9	0.2	47.8	0.0	5	8.2	1.077	1.7	1.3	7.0
Ruby Lou	20	5.6	16.3	21.9	0.0	38.2	0.0	15	6.0	1.075	2.5	1.2	5.3
Saginaw Gold	30	1.6	9.4	29.1	0.0	38.5	0.0	14	7.0	1.073	2.3	3.0	5.3
Yukon Gold	24	2.7	6.2	28.0	0.5	34.7	0.3	18	5.4	1.077	1.8	2.8	7.0
92-27-3	30	3.4	11.8	20.2	0.8	32.7	0.0	21	7.6	1.081	3.2	1.0	6.3
95-37-12	24	5.5	17.1	26.4	0.0	43.4	0.0	10	8.8	1.079	2.7	1.0	5.7
97-1-5	30	4.3	15.1	26.2	0.0	41.3	0.0	12	10.6	1.062	1.2	1.3	6.7
97-9-10	20	2.8	12.6	48.2	0.3	61.0	0.0	1	7.2	1.064	3.2	2.0	7.0
97-12-9	24	3.7	12.8	42.7	0.0	55.5	0.0	2	8.4	1.072	2.2	1.7	7.0
97-24-1	30	6.0	11.7	16.8	0.0	28.5	0.0	23	8.6	1.092	3.5	2.5	6.0
97-38-2 (W Star)	24	4.0	15.3	19.9	0.2	35.4	0.0	17	7.1	1.071	2.5	1.3	6.0
97-38-3	24	6.0	15.5	28.7	0.5	44.8	0.0	7	8.6	1.066	1.0	1.0	5.3
97-39-8	30	6.1	8.9	7.9	0.0	16.8	0.0	26	7.6	1.077	3.3	2.5	6.0
97-47-6	24	1.5	4.2	12.3	0.0	16.4	0.0	27	3.0	1.077	3.5	1.0	5.7
97-64-1	24	1.5	2.5	4.6	0.0	7.1	0.0	28	6.4	1.070	2.0	1.5	7.0
97-74-3	24	7.8	14.5	11.9	0.0	26.4	0.0	24	10.6	1.088	3.3	2.0	6.0
97-85-3	24	9.4	18.9	14.5	0.0	33.3	0.0	20	9.7	1.073	2.5	2.5	5.0
97-86-20	24	2.2	6.2	34.7	0.5	41.4	0.3	11	6.0	1.072	1.7	2.3	7.0
97-86-35	24	5.1	11.7	23.9	0.2	35.9	0.0	16	7.4	1.068	3.3	2.5	6.0
97-86-46	24	4.1	8.8	30.3	0.0	39.2	0.3	13	6.7	1.067	3.2	1.3	7.0
97-102-1	20	3.3	11.1	32.8	0.5	44.3	0.0	8	6.5	1.078	3.2	2.3	5.3
97-105-30	20	14.5	16.5	9.1	0.0	25.6	0.0	25	8.6	1.083	3.2	2.3	5.7
Significance+		skew	***	***	skew	***	skew		***	***	***	***	***
LSD P = 0.05			3.9	8.3		9.1			1.6	0.003	0.8	0.6	1.1
LSD P = 0.01						12.1							

* Tuber characteristics: **bold** typeface = suitable, plain type = questionable, *italic* = unsuitable.
§ ACD (after-cooking-darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
~ Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy.
# Samples assessed visually after crisping: 1 - 10, 7 = borderline, >7 = too dark for domestic French-fries.
+ "skew" indicates data did not fulfil assumptions of analysis of variance.

9.4.7. Experiment 01MA11 - October 2001 planted district trial at Manjimup.

Aim

To select entries suited to fresh market production in an October planting. Multipurpose white skinned varieties are required. The standard varieties are Nadine and Delaware.

Results

The trial grew well with high rates of emergence except for Eureka (78% of plants emerged), 89-88-3 (79%), 97-86-46 (76%), and 97-102-1 (77%). Yield and quality data are shown in Table 9.4.7.

To be selected white skinned potatoes had to have suitable tuber characteristics with specific gravity greater than 1.066 (not significantly less than Delaware) with yield greater than 47.7 t/ha (not highly significantly less than Delaware), with after-cooking-darkening and slough less than 3.5 with no major faults. Cadmium could not be significantly higher than Delaware. Selections were Coliban, 96-88-7 and 97-38-2. 97-1-5 was not selected as it had significantly higher cadmium levels than Delaware.

For reds to be selected an improvement over Ruby Lou was required. Red Rascal was selected for its darker skin colour.

For export, high yield and dark yellow flesh is needed. No entries met these export criteria.

9.4.8. Selections for demonstrations of the thirteenth series of fresh market trials.

Eleven new entries from the thirteenth, or "97" series are shown in Table 9.4.8. To be tested in demonstrations entries had to be selected in one of the district trials and shown to have an advantage over the standard varieties. The selections from the May district trial would only be tested in the May demonstration. Selections from the other three trials would be tested in all three remaining demonstrations.

The seven selections from the May trial were Maris Piper, Red Rascal, 97-38-2 (White Star), 97-47-6, 97-64-1, 97-74-3 and 97-86-20. Four of these May selections were not selected in other district trials and so they will only be planted in the May planted demonstration. The three other May selections, Red Rascal, 97-38-2 (White Star) and 97-86-20, were also selected in the other trials and so they will be tested in all demonstrations.

Table 9.4.7. Yield and quality of fresh market entries in an October 2001 planted district trial at Manjimup.

Planted: 9 October 2001 Harvested: 20 February 2002 Soil type: sandy loam
Row spacing: 80 cm Soil temp. at harvest: 19°C Elevation: 200 m

Entry tuber* characteristics & spacing in rows (cm)		Yield (t/ha)						Rank by Grade No.1	Tuber no. per plant	Quality				
		Chats 0-70g	Small 70-120g	Med-ium 120-350g	Large 350-450g	Grade No. 1 70-450g	Over size >450g			SG	ACD §	Slou-gh ing~	Fry# color	Cd@ mg/kg f wt
Coliban	15	2.5	7.2	52.6	2.6	62.4	0.0	3	5.7	1.072	2.8	1.5	5.7	
Delaware	15	2.7	9.6	46.9	3.4	59.9	0.3	6	6.0	1.070	2.7	1.5	7.3	0.051
Eureka	20	1.9	5.7	42.1	7.9	55.8	3.3	12	7.8	1.079	3.5	2.5	5.7	0.046
Maris Piper	24	7.1	21.8	37.8	0.0	59.6	0.0	7	13.8	1.082	3.5	2.5	6.7	0.052
Mondial YF	15	3.6	9.5	52.3	2.5	64.3	0.3	1	6.5	1.065	3.3	1.5	7.7	
Nadine	15	7.7	15.5	39.1	1.9	56.4	1.0	11	8.0	1.056	1.3	1.2	9.7	0.055
Red Rascal R	24	4.1	15.4	41.5	0.4	57.4	0.3	9	10.4	1.081	1.5	1.5	5.7	0.056
Redstar R	24	3.2	12.6	38.9	0.0	51.5	0.0	17	8.6	1.077	2.0	1.3	5.0	
Ruby Lou R	20	4.9	14.2	40.0	0.6	54.9	0.0	13	8.6	1.075	3.0	1.7	4.0	
Saginaw gold	30	2.8	11.5	18.6	0.0	30.1	0.0	34	7.6	1.075	2.5	2.2	6.0	
Saxon	24	2.9	10.6	44.5	1.3	56.4	0.3	10	8.3	1.069	1.5	1.3	7.3	0.051
Victoria YF	24	1.6	7.2	42.0	0.3	49.4	0.0	21	6.9	1.074	1.7	1.0	6.3	
Yukon Gold YF	24	1.5	5.4	33.6	1.0	40.0	0.9	30	5.8	1.080	1.3	2.7	6.3	
89-88-3	24	3.3	8.4	20.9	0.0	29.3	0.0	36	8.0	1.086	2.8	3.7	5.7	
92-27-2	30	1.7	7.0	34.8	2.0	43.8	2.2	25	7.5	1.081	3.8	1.0	5.0	
95-37-12	24	2.2	8.8	38.9	2.4	50.1	1.1	19	7.8	1.076	3.2	1.0	5.7	
96-88-7	24	1.8	9.1	38.1	1.9	49.1	0.0	22	9.1	1.067	3.2	1.2	6.3	
97-1-5	30	3.0	13.8	38.3	0.3	52.3	0.3	16	12.3	1.069	2.0	1.0	7.0	0.068
97-9-10	24	3.0	8.0	45.3	6.0	59.3	2.7	8	8.5	1.073	3.7	1.3	7.0	
97-10-6	30	5.0	17.1	24.8	0.7	42.7	0.0	28	14.1	1.087	3.7	2.8	5.3	
97-12-9	24	1.2	6.1	43.9	3.3	53.4	0.0	15	7.0	1.078	2.8	1.7	7.3	
97-24-1	30	3.8	11.9	31.5	1.9	45.3	0.0	23	10.7	1.091	3.2	1.7	4.3	
97-38-2	24	1.3	4.8	52.1	4.3	61.2	0.9	5	7.0	1.074	3.3	1.3	5.0	0.056
97-38-3	24	3.6	12.1	50.1	0.7	62.9	0.0	2	10.0	1.069	1.5	1.2	5.0	
97-39-8	24	2.3	9.7	28.9	0.0	38.6	0.3	32	6.6	1.082	3.5	2.5	6.7	
97-47-6	24	1.3	5.2	23.1	1.0	29.4	0.3	35	4.4	1.081	3.0	1.0	6.0	
97-64-1	24	1.4	5.9	34.6	1.7	42.3	1.9	29	5.5	1.081	3.3	2.5	4.3	
97-74-3	24	6.5	18.2	31.1	0.2	49.5	0.0	20	10.7	1.089	3.0	2.5	6.3	0.043
97-84-6	24	2.0	7.8	46.0	0.0	53.8	0.0	14	7.4	1.083	4.0	1.7	3.0	
97-84-16	24	4.9	20.5	40.4	0.5	61.3	0.0	4	11.5	1.081	4.0	2.3	4.3	0.066
97-85-3	24	5.5	14.0	35.9	0.3	50.2	0.0	18	10.1	1.082	3.0	2.7	6.0	
97-86-20	24	1.5	4.5	31.9	2.5	38.9	2.4	31	6.6	1.071	2.0	2.0	7.3	
97-86-35	24	1.4	3.6	26.3	5.2	35.2	0.0	33	5.4	1.072	2.7	2.2	5.0	
97-86-46	24	1.5	4.0	31.2	8.6	43.8	4.7	26	7.1	1.075	2.8	1.7	7.3	
97-102-1	24	0.9	3.4	31.1	8.5	43.0	7.2	27	6.3	1.084	3.5	2.3	6.0	0.059
97-105-30	24	2.7	10.4	33.3	0.4	44.1	0.5	24	9.4	1.090	3.0	3.2	4.3	
Significance+		***	***	***	skew	***	skew		***	***	***	***	***	***
LSD P = 0.05		1.4	4.5	9.0		9.1			1.3	0.004	0.9	0.7	1.6	0.013
LSD P = 0.01						12.2								

***** Tuber characteristics: **bold** typeface = suitable, plain type = questionable, *italic* = unsuitable.
§ ACD (after-cooking-darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
~ Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy.
# Samples assessed visually after crisping: 1 - 10, 7 = borderline, >7 = too dark for domestic French-fries.
@ Cd = cadmium - maximum permitted concentration = 0.1 mg/kg fresh weight.
+ "skew" indicates data did not fulfil assumptions of analysis of variance.

Table 9.4.8. Entries selected for testing in demonstrations of the 13th series of fresh market trials.

Entry	Trial selected	Powdery scab reaction (from 1st screening in Table 9.4.12.1 unless otherwise indicated).	Comments	Re-test?
Eureka	01BU4A		Already tested commercially	No
Coliban	01BU4B 01MA11		Standard variety for eastern states	No
Maris Piper	01PE8	tolerant	PCN resistant, test in May demo only.	Yes, May only
Red Rascal	01PE8 01BU4A 01BU4B 01MA11	tolerant	Red skin, not PCN resistant. Better colour than Ruby Lou	Yes, all sites
95-37-12	01BU4B			Yes, not May
96-88-7	01MA11			Yes, not May
97-12-9	01BU4B			Yes, not May
97-38-2 (White Star)	01PE8 01BU4A 01MA11	tolerant		Yes, all sites
97-38-3	01BU4A		Despite appearance, high yield	Yes, not May
97-47-6	01PE8	tolerant	Despite yield	Yes, May only
97-64-1	01PE8	tolerant		Yes, May only
97-74-3	01PE8	tolerant	Despite yield	Yes, May only
97-86-20	01PE8 01BU4B	tolerant		Yes, all sites

9.4.9. Experiment 02AL39PE - May 2002 planted demonstration at Mandogalup.

Aim

To demonstrate and select, under commercial conditions, entries suited for fresh market winter production in a May planting. Selections must produce high yield of large tubers and skins must set hard early to enable prompt harvest. Selections must also have suitable appearance (tuber characteristics), versatile cooking quality with specific gravity much higher than Nadine, tolerance to powdery scab and no major faults. Resistance to PCN is also desirable. The current standards are Mondial and Nadine.

Results

The trial grew well through hard, windy, cold conditions. Yield and quality data are shown in Table 9.4.9. Tuber characteristics were suitable for Maris Piper, 90-40-1 (Ruby Lou), 97-38-2 (White Star), 97-47-6 (Combo), 97-64-1 (Astra), 97-74-3 (Vectra) and 97-86-20 (Cruze). Of these 97-86-20 (Cruze) had high internal defects and should not be tested further.

Culinary quality was best for 90-40-1 (Ruby Lou) and 97-38-2 (White Star). These varieties also had

Table 9.4.9. Yield and quality of fresh market entries in a May 2002 planted demonstration at Mandogalup.

Planted: 17 May 2002 Harvested: 17 October 2002 Soil temperature at harvest: 19°C
Row spacing: 70 cm Soil type: alkaline sand Elevation: 20 m

Entry, tuber characteristics* & spacing in row		Yield (t/ha)						Rank by Grade No 1	Tuber		Quality								Disease reaction	
		Chats	Small	Med-ium	Large	Grade No 1	Over size		no per plant	Av mkt wt (g)	SG	Culinary tests#					Flesh† faults	% skin bloom	Pwd scab	PCN‡
	cm	0-70g	70-120g	120-350g	350-450g	70-450g	>450g					taste	salad	mash	micro	fry	(%)	(14 days)	@	
Delaware	25	2.4	12.1	42.4	1.8	56.3	0.3	1	8.8	137	1.071	**	**	**	**	*	0	0	tol	no
Maris Piper	30	3.6	7.6	30.4	1.2	39.2	0.3	7	8.9	135	1.070	**	***	**	***	*	0	20	tol	yes
Mondial	15	2.8	7.2	33.1	9.0	49.4	14.3	3	5.1	217	1.061	**	***	*	*	*	0	72	tol	yes
Nadine	25	4.0	9.4	20.1	1.6	31.1	0.7	11	7.4	120	1.054	nr	***	**	**	nr	0	0	?	yes
Red Rascal	25	3.8	7.2	36.4	4.9	48.6	1.7	4	8.8	134	1.067	**	***	**	**	*	0	72	tol	no
Saxon	25	3.4	8.0	33.9	1.9	43.8	0.3	6	6.8	159	1.069	**	***	**	***	*	0	0	£	yes
90-40-1 (Ruby Lou)	20	5.5	11.1	38.4	1.5	51.0	2.0	2	8.5	129	1.073	***	***	***	***	***	0	28	susc	no
97-38-2 (White Star)	30	1.5	4.9	41.2	1.2	47.3	0.0	5	7.3	165	1.068	**	***	***	***	**	0	4	tol	50%
97-47-6 (Combo)	25	2.4	4.1	27.0	3.8	34.8	0.6	10	6.5	150	1.072	*	**	**	**	*	2	0	?	50%
97-64-1 (Astra)	25	1.5	4.8	27.3	5.6	37.7	1.4	8	6.6	174	1.075	*	**	**	**	**	2	0	?	50%
97-74-3 (Vectra)	30	5.1	13.7	21.3	0.0	35.0	6.9	9	11.5	115	1.087	**	*	**	**	**	0	40	?	50%
97-86-20 (Cruze)	25	1.5	2.9	18.1	9.7	30.7	0.9	12	6.2	218	1.067	*	**	**	**	nr	14†	0	tol	no

* Tuber characteristics: **bold** face = suitable, plain = questionable, *italic* = unsuitable.
# Potato Marketing Corporation assessment: *** = excellent, ** = good, * = fair, nr = not recommended.
† Flesh faults; * indicates significantly different internal disorders from Delaware.
@ Tested in disease screening trials, 2 consistent results over 2 seasons required: tol = tolerant, h sus = highly susceptible, ? = inconsistent results, § = 1 test only.
£ Not tested but breeder reports good resistance.
‡ Determined from literature, 50% indicates 50% chance of resistance due to one parent being resistant.

the best yields of the remaining selections by over 8 tonnes/ha. Small scale commercial tests of Maris Piper and 97-38-2 (White Star), which were grown adjacent to the demonstration, showed that yields of both were similar at around 36 t/ha. Therefore Maris Piper should not be rejected for its yield in the demonstration but should be considered for further testing.

Final selections were Maris Piper, 90-40-1 (Ruby Lou) (red) and 97-38-2 (White Star).

9.4.10. Experiments 02AL39BU1 & 2 - July 2002 & February 2003 planted demonstrations at Jindong.

Aim

To demonstrate and select, under commercial conditions, entries suited to spring and autumn production. Previously we had been selecting material which performed well at both the planting times. Now new advice from Potato Variety Commercialisation Group is that new varieties that are suited to just one of these planting times will be acceptable.

Results

July planting

This is the first of a pair of demonstrations to test the suitability of new varieties for the double cropping system used on the Swan Coastal Plain. Yield and quality data are shown in Table 9.4.10.1. The current standard is Nadine. Selections need to have suitable appearance (tuber characteristics), versatile cooking quality with specific gravity similar to Delaware (or at least greater than 1.065), high yields and no major faults.

The trial did not close, probably due to a combination of pesticide phytotoxicity and insufficient fertiliser. Therefore yield was not be used as a selection criterion. Delaware and 97-12-9 (Commodore) had unsuitable tuber characteristics, while Nadine and 97-38-3 (Statesman) did not fry. Of the remaining entries, cooking quality was best for 95-11-20 (Auski), 90-40-1 (Ruby Lou) Saxon and 95-37-12 (Billabong). Cooking quality was inferior for 89-12-1 (Eureka), Mondial, Red Rascal, 97-38-2 (White Star) and 97-86-20 (Cruze). Saxon had the poorest bloom after storage (24%) while all other varieties had bloom on 92% of tubers. Saxon was therefore not selected and this left: 95-11-20 (Auski), Ruby Lou and 95-37-12 (Billabong). Ruby Lou and Red Rascal have coloured skins and Red Rascal's skin colour was darker than Ruby Lou's in this planting.

February planting

This is the second of a pair of unreplicated demonstrations to test the suitability of new varieties for the double cropping system of the Swan Coastal Plain. Both cut and round seed were used for each entry. Varieties that emerge well from cut seed under the hot planting conditions are preferred. Yield and quality data are shown in Table 9.4.10.2. Most varieties emerged well but 97-38-2 (White Star) had only 54% emergence with round seed and just 36% with cut seed. Last year in the district trial (Experiment 01BU4B – Section 9.4.6) 97-38-2 (White Star)

Table 9.4.10.1. Yield and quality of fresh market entries in a July 2002 planted demonstration at Jindong.

Planted: 2 July 2002 | Harvested: 27 November 2002 | Soil temperature at harvest: 19°C
Row spacing: 75 cm | Soil type: clay loam | Elevation: 40 m

Entry & tuber* characteristics	Spacing in rows (cm)	Yield (t/ha)						Rank by Grade No 1	Tuber no per plant	Quality							
		Chats	Small	Medium	Large	Grade No 1	Oversize			SG	Culinary tests#					Flesh† faults	% skin bloom (14 days)
		0-70g	70-120g	120-350g	350-450g	70-450g	>450g				taste	salad	mash	micro	fry		
Delaware	25	10.8	15.3	1.3	0.0	16.6	0.0	12	12.8	1.061	**	***	**	**	*	12†	100
Mondial	15	1.9	12.4	27.2	0.7	40.3	0.0	1	5.3	1.056	*	***	**	*	*	0	100
Nadine	25	5.4	16.4	10.1	0.0	26.5	0.0	6	9.6	1.055	nr	***	**	**	nr	0	92
Red Rascal	25	3.6	14.0	14.3	0.0	28.3	0.0	3	9.0	1.066	*	***	**	*	***	0	100
Saxon	25	5.3	13.3	4.3	0.0	17.6	0.0	11	8.3	1.067	**	***	**	**	**	0	24
89-12-1 (Eureka)	25	4.5	13.9	12.0	0.0	25.9	0.0	7	8.6	1.073	**	***	***	*	**	0	100
90-40-1 (Ruby Lou)	25	6.1	14.6	9.6	0.0	24.2	0.0	8	9.5	1.068	**	***	***	**	***	0	100
95-11-20 (Auski)	20	5.0	11.3	9.8	0.0	21.1	0.0	10	7.1	1.064	**	***	**	***	**	0	100
95-37-12 (Billabong)	30	3.7	11.5	5.0	0.0	16.6	0.0	13	5.9	1.065	***	***	***	***	**	0	100
97-12-9 (Commodore)	25	4.6	14.9	7.9	0.0	22.8	0.0	9	8.2	1.063	***	***	***	**	*	0	96
97-38-2 (White Star)	25	2.5	14.7	13.1	0.0	27.8	0.0	4	6.8	1.064	***	***	*	***	***	0	100
97-38-3 (Statesman)	25	7.7	22.4	9.1	0.0	31.4	0.0	2	12.5	1.060	**	***	***	***	nr	0	96
97-86-20 (Cruze)	20	6.8	10.4	16.5	0.0	26.8	0.0	5	9.0	1.069	**	***	***	**	*	0	100

* Tuber characteristics: **bold** face = suitable, plain = questionable, *italic* = unsuitable.
# Potato Marketing Corporation assessment: *** = excellent, ** = good, * = fair, nr = not recommended.
† Flesh faults: "+" indicates significantly different from standard variety.

Table 9.4.10.2. Yield and quality of fresh market entries in a February 2002 planted demonstration at Jindong.

Planted: 4 February 2003 | Harvested: 11 June 2003 | Soil temperature at harvest: 8°C
Row spacing: 75 cm | Soil type: clay loam | Elevation: 40 m

Entry & tuber* characteristics	Spacing in rows (cm)	Yield from round seed (t/ha)						Cut seed yield (% of round seed)	Rank by Grade No 1	Tuber no per plant	Quality							
		Chats	Small	Medium	Large	Grade No 1	Over size				SG	Culinary tests#					Flesh† faults	% skin bloom (14 days)
		0-70g	70-120g	120-350g	350-450g	70-450g	>450g					taste	salad	mash	micro	fry		
Delaware	25	5.0	7.9	12.0	1.1	20.9	0.0	67	9	7.4	1.059	**	***	**	**	*	0	100
Eureka	25	4.2	8.7	11.6	0.0	20.3	0.0	105	12	8.4	1.069	***	**	**	**	**	0	100
Mondial	15	3.4	6.3	28.1	0.8	35.2	0.0	82	1	5.2	1.054	**	**	***	***	*	0	100
Nadine	25	3.7	6.7	14.5	0.5	21.7	0.0	83	7	18.1	1.051	nr	***	*	***	nr	2	100
Red Rascal	25	9.0	12.9	15.6	0.0	28.5	0.0	86	4	14.3	1.071	**	***	*	***	**	0	100
Saxon	25	2.4	7.0	22.7	0.0	29.8	0.0	71	2	6.6	1.063	**	***	**	*	*	0	100
90-40-1 (Ruby Lou)	20	3.4	9.3	16.2	0.0	25.5	0.0	65	5	7.7	1.068	***	***	*	**	***	0	100
95-11-20 (Auski)	20	3.9	11.5	17.9	0.3	29.7	0.5	68	3	6.3	1.059	***	***	***	***	***	0	24
95-37-12 (Billabong)	30	3.3	5.9	8.1	0.0	14.0	0.0	50	13	6.9	1.068	***	***	***	***	**	0	100
97-12-9 (Commodore)	25	2.0	5.3	15.9	0.0	21.2	0.0	94	8	5.3	1.061	***	***	***	***	**	0	100
97-38-2 (White Star)	25	3.2	8.4	12.3	0.0	20.7	0.0	68	11	12.7	1.066	*	***	*	**	***	2	36
97-38-3 (Statesman)	25	1.6	6.0	17.1	0.0	23.1	0.0	61	6	5.5	1.062	***	***	***	***	***	6	28
97-86-20 (Cruze)	20	3.4	6.8	13.9	0.0	20.8	0.0	101	10	6.5	1.065	*	***	***	***	**	2	96

* Tuber characteristics: **bold** face = suitable, plain = questionable, *italic* = unsuitable.
# Potato Marketing Corporation assessment: *** = excellent, ** = good, * = fair, nr = not recommended.
† Flesh faults: "+" indicates significantly different from standard variety.

had 99% emergence with cut seed). Nadine had only 41% emergence with round seed but 73% emergence with cut seed. The demonstration was severely damaged by cattle just before row closure. After this grazing and trampling the trial didn't close, didn't grow well and died early. Yields were low and so yield was not used as a selection criterion. Selections had suitable tuber characteristics, versatile cooking quality (at least one star for each cooking test) with no major faults.

Selection from this demonstration is fraught with problems due to the poor growth. Selections were Saxon, 95-37-12 (Billabong) and 97-86-20 (Cruze). Of these 95-37-12 (Billabong) had the best culinary characteristics.

95-11-20 (Auski) should also be considered. This entry was not discussed above because it had questionable tuber characteristics due to bumpy eyebrows which, most probably, were caused by the stress due to the crop damage. 95-11-20 (Auski) has performed well at this planting time in previous demonstrations. In this test the other disadvantage of 95-11-20 (Auski) was its poor bloom. This was, however due, in part, to its early death, 2-3 weeks before other varieties which meant that aged tubers were assessed.

Selections from both demonstrations
Two of the selections listed above were also selected in the previous July planted demonstration: these were 95-37-12 (Billabong) and 97-86-20 (Cruze).

9.4.11. Experiment 02AL39BU3 – November 2002 planted demonstration at Pemberton.

Aim
To demonstrate and select, under commercial conditions, entries suited to fresh and export market production in a November planting. The current standard is Nadine but varieties with more versatile culinary quality are required

Results
Yield and quality results are shown in Table 9.4.11.

Domestic fresh market
First tier selections had suitable tuber characteristics, yield similar to Nadine, more versatile culinary quality than Nadine, no major faults and cadmium not significantly greater than Delaware. Cadmium levels were measured in the previous season's district trial (Experiment 01MA11 – Section 9.4.7). Candidates for first selection were Ruby Lou and 95-37-12 (Billabong). Ruby Lou had an unacceptable level of fleck. The cadmium levels in 97-1-5 (Caprice) were too high. The remaining entry, 95-37-12 (Billabong), had the best bloom with 68% of tubers shining after two weeks storage. Second tier selections had questionable tuber characteristics, yield greater than Nadine, more versatile culinary quality than Nadine, no major faults and cadmium not significantly greater than Delaware. Candidates for second tier selection were. 95-11-20 (Auski), 94-105-2 (Discus), 89-12-1 (Eureka,) Granola, 96-88-7

Table 9.4.11. Yield and quality of fresh market entries in a November 2002 planted demonstration at Pemberton.

Planted: 7 November 2002 | Harvested: 18 March 2003 | Soil temperature at harvest: 17°C
Row spacing: 75 cm | Soil type: Karri loam | Elevation: 200 m

Entry & tuber* characteristics	Spacing in rows (cm)	Yield (t/ha)						Rank by Grade No 1	Tuber no per plant	Quality								
		Chats	Small	Medium	Large	Grade No 1	Oversize			SG	Culinary tests#					Flesh faults (%)†	% skin bloom (14 days)	Cd@
		0-70g	70-120g	120-350g	350-450g	80-450g	>450g				taste	salad	mash	micro wave	fry			
Delaware	15	3.0	7.7	28.6	0.2	36.5	0.2	12	4.5	1.065	**	***	**	**	**	2	0	0.051
Granola	15	15.9	13.0	11.4	0.0	24.5	0.0	15	11.7	1.060	**	***	***	**	*	0	0	
Maris Piper	35	6.1	15.3	26.6	0.0	**42.0**	0.0	8	16.6	1.080	**	**	**	nr	**	38†	0	0.052
Nadine	20	13.6	17.2	20.1	0.0	37.3	0.0	11	15.2	1.053	nr	***	***	**	nr	6	16	0.055
Red Rascal	25	10.5	18.5	16.0	0.0	34.5	0.0	13	17.8	1.076	**	**	**	**	***	0	20	0.056
89-12-1 (Eureka)	25	2.5	5.5	40.3	2.3	**48.1**	0.9	2	7.5	1.073	*	nr	*	**	*	0	28	0.046
90-40-1 (Ruby Lou)	20	6.0	13.5	29.8	0.4	**43.7**	0.0	5	7.3	1.071	**	***	***	nr	**	34†	0	
94-105-2 (Discus)	25	9.0	13.3	25.2	0.5	39.0	0.0	10	14.0	1.071	**	***	**	***	***	0	**56**	
95-11-20 (Auski)	25	4.8	8.4	42.5	3.0	**53.9**	0.2	1	10.2	1.072	**	***	*	***	***	0	**48**	
95-37-12 (Billabong)	25	6.8	9.9	33.3	0.5	**43.7**	0.6	4	11.3	1.076	**	***	*	*	***	0	**68**	
96-88-7 (Franklin)	25	1.9	5.2	32.1	2.4	39.6	0.2	9	6.6	1.061	***	***	***	***	***	0	0	
97-1-5 (Caprice)	30	2.7	8.1	26.1	0.3	34.5	0.0	14	9.2	1.063	***	***	***	***	**	0	**48**	0.068
97-38-2 (White Star)	25	2.4	8.3	33.9	0.5	**42.7**	0.0	7	7.7	1.068	**	***	*	**	***	6	0	0.056
97-38-3 (Statesman)	25	2.8	10.8	36.0	0.8	**47.7**	0.6	3	8.2	1.060	**	***	***	**	**	18	16	
97-102-1 (Monaro)	25	1.4	7.9	31.7	3.2	**42.8**	0.5	6	5.5	1.084	**	**	***	*	***	0	24	0.059
Significance+																		***
LSD P = 0.05																		0.013

* Tuber characteristics: **bold** face = suitable, plain = questionable, *italic* = unsuitable.
# Potato Marketing Corporation assessment: *** = excellent, ** = good, * = fair, nr = not recommended.
† Flesh faults: † indicates significantly different from standard variety.
@ Cd = cadmium - maximum permitted concentration = 0.1 mg/kg fresh weight. Results from previous seasons replicated trial (experiment 01MA11).

(Franklin), 97-38-3 (Statesman), 97-102-1 (Monaro). The yields of 94-105-2's (Discus), Granola's and 96-88-7's (Franklin) were too low. 89-12-1 (Eureka) had poor cooking quality (ACD). This left 95-11-20 (Auski), 97-38-3 (Stateman) and 97-102-1 (Monaro). However 95-11-20 (Auski) had much better bloom than these other two and so it alone should be selected. 97-102-1 was tested for French-fry potential but its shape is too distorted. Therefore the most promising selections were 97-37-12 (Billabong) and 95-11-20 (Auski).

Farmers and industry representatives voted on the entries at harvest by assessing appearance, uniformity and skin quality and yield. Their selections were 97-37-12 (Billabong) (28 votes), Nadine (10 votes) and 95-11-20 (Auski)(9 votes).

Export fresh market

The export fresh market requires high yielding, deep-yellow fleshed tubers that boil well while the export crisp market requires high yielding crisp types. Fresh export market selections had yellow flesh, high yield and good boiling and fry quality with no major faults. The only entries that met these criteria were Granola and 97-1-5 (Caprice). 97-1-5 (Caprice) had higher yield than Granola but its cadmium level was significantly higher than Delaware and so should not be selected.

9.4.12. Experiments 01PE10 & 02AL40 - Disease screening trials.

Aim

To determine disease reaction of entries to powdery scab and crocodile skin.

Results

Powdery scab

Powdery scab results for one screening are shown in Table 9.4.12.1. Five entries tested in the demonstrations appear to be tolerant to powdery scab.

For the fresh market, entries tolerant to powdery scab were Maris Piper, Red Rascal, 97-38-2 (White Star) and 97-86-20 (Cruze). 95-37-12 (Billabong) was only tested once and was found to be tolerant. This result needs to be confirmed in future tests.

The sole crisp entry tolerant to powdery scab was 97-28-1.

Crocodile skin

Crocodile skin results for both trials are shown in Table 9.4.12.2. Seven entries appear to be tolerant to crocodile skin.

For the fresh market, entries tolerant to crocodile skin were Maris Piper, 97-38-2 (White Star) 97-47-6 (Combo) and 97-102-1 (Monaro).

Tolerant crisp entries were 94-28-1, 97-84-6 and 97-84-16.

Table 9.4.12.1. Field tolerance to powdery scab of potato entries in a trial at Baldivis 2001 & 2002.

Entry	Market type if not fresh	Trial				Susceptibility over both screenings
		01PE10		02AL40		
		Severity* score	Susceptibility rating~	Arcsin** severity score	Susceptibility rating~	
Atlantic	crisp	1.86	tolerant	1.21	tolerant	tolerant
Desiree (tolerant control)		1.87	tolerant	0.44	tolerant	tolerant
Maris Piper		1.04	tolerant	0.29	tolerant	tolerant
Nadine		2.26	tolerant	0.80	tolerant	tolerant
Red Rascal		0.58	tolerant	0.73	tolerant	tolerant
Saginaw Gold		2.13	tolerant	-	-	-
Yukon Gold		2.54	highly susc.	-	-	-
89-88-3		2.49	highly susc.	-	-	-
90-2-6 (Bliss)	crisp	2.56	highly susc.	2.12	susceptible	susceptible
92-27-3		1.65	tolerant	-	-	-
94-28-1	crisp	1.70	tolerant	1.64	tolerant	tolerant
95-37-12 (Billabong)		2.52	highly susc.	-	-	
96-136-4 (Crusher)		2.07	tolerant	-	-	-
97-1-5		2.77	highly susc.	1.86	susceptible	susceptible
97-9-10		2.53	highly susc.	-	-	-
97-10-6		2.76	highly susc.	-	-	-
97-12-9 (Commodore)		2.72	highly susc.	-	-	-
97-24-1		2.32	susceptible	-	-	-
97-38-2 (White Star)		2.01	tolerant	1.58	tolerant	tolerant
97-38-3 (Satesman)		2.50	highly susc.	-	-	-
97-39-8		2.43	highly susc.	-	-	-
97-47-3		2.60	highly susc.	-	-	-
97-47-6		2.18	tolerant	4.00	highly susc.	inconsistent
97-64-1		2.18	tolerant	2.36	highly susc.	inconsistent
97-74-3 (Vectra)	crisp	2.17	tolerant	2.06	susceptible	inconsistent
97-84-6	crisp	2.54	highly susc.	4.57	highly susc.	highly susc.
97-84-16	crisp	2.46	highly susc.	3.40	highly susc.	highly susc.
97-85-3		1.96	tolerant	-	-	-
97-86-20 (Cruze)		1.07	tolerant	0.88	tolerant	tolerant
97-86-35		2.66	highly susc.	-	-	-
97-86-46		2.40	susceptible	-	-	-
97-102-1 (Monaro)		2.55	highly susc.	4.50	highly susc.	highly susc.
97-105-3		2.20	tolerant	-	-	-
Significance+		***		***		
LSD P = 0.05		0.41		1.32		
LSD P = 0.01		0.54		1.74		

* Severity = number of tubers with 0-5% surface covered with disorder + (tubers with 5-25% disorder x 2) + (tubers with >25% disorder x 3) divided by total number of tubers.

** Arcsin severity score same as above but with data transformed to meet conditions for ANOVA.

~ Rating = tolerant if severity score is not sig. diff (5%) to the tolerant control,
Rating = susceptible if the severity score is sig. greater (1%<P<5%) than the tolerant control,
Rating = highly susceptible if the severity score is highly significantly (P<1%) greater than the control.

Table 9.4.12.2. Field tolerance to crocodile skin of potato entries in a trial at Baldivis 2001 & 2002.

Entry	Market type if not fresh	Trial				Susceptibility over both screenings
		01PE10		02AL40		
		Severity* score	Susceptibility rating~	Severity* score	Susceptibility rating~	
Atlantic	crisp	0.51	highly susc.	0.96	highly susc.	highly susc.
Desiree (tolerant control)		0.38	highly susc.	1.07	highly susc.	highly susc.
Maris Piper		0.06	tolerant	0.04	tolerant	tolerant
Nadine		0.01	tolerant	0.08	tolerant	tolerant
Red Rascal		0.37	highly susc.	0.95	highly susc.	highly susc.
Saginaw Gold		0.02	tolerant	-	-	-
Yukon Gold		0.01	tolerant	-	-	-
89-88-3		0.03	tolerant	-	-	-
90-2-6 (Bliss)	crisp	0.24	tolerant	0.67	highly susc.	inconsistent
92-27-3		0.53	highly susc.	-	-	-
94-28-1	crisp	0.03	tolerant	0.02	tolerant	tolerant
95-37-12 (Billabong)		0.28	tolerant	-	-	-
96-136-4 (Crusher)		0.23	tolerant	-	-	-
97-1-5		1.12	highly susc.	1.65	highly susc.	highly susc.
97-9-10		0.02	tolerant	-	-	-
97-10-6		0.09	tolerant	-	-	-
97-12-9 (Commodore)		0.07	tolerant	-	-	-
97-24-1		0.06	tolerant	-	-	-
97-38-2 (White Star)		0.01	tolerant	0.13	tolerant	tolerant
97-38-3 (Satesman)		0.06	tolerant	-	-	-
97-39-8		0.08	tolerant	-	-	-
97-47-3		0.01	tolerant	-	-	-
97-47-6		0.01	tolerant	0.02	tolerant	tolerant
97-64-1		0.13	tolerant	0.61	highly susc.	inconsistent
97-74-3 (Vectra)	crisp	0.17	tolerant	0.78	highly susc.	inconsistent
97-84-6	crisp	0.01	tolerant	0.00	tolerant	tolerant
97-84-16	crisp	0.03	tolerant	0.04	tolerant	tolerant
97-85-3		0.34	susceptible	-	-	-
97-86-20 (Cruze)		1.39	highly susc.	1.18	highly susc.	highly susc.
97-86-35		0.26	tolerant	-	-	-
97-86-46		0.87	highly susc.	-	-	-
97-102-1 (Monaro)		0.02	tolerant	0.09	tolerant	tolerant
97-105-3		0.01	tolerant	-	-	-
Significance+		***		***		
LSD P = 0.05		0.27		0.18		
LSD P = 0.01		0.36		0.23		

* Severity = number of tubers with 0-5% surface covered with disorder + (tubers with 5-25% disorder x 2) + (tubers with >25% disorder x 3) divided by total number of tubers.
~ Rating = tolerant if severity score is not sig. diff (5%) to the tolerant control,
Rating = susceptible if the severity score is sig. greater (1%<P<5%) than the tolerant control,
Rating = highly susceptible if the severity score is highly significantly (P<1%) greater than the control.

9.4.13. Selections from the thirteenth series of fresh domestic & export market trials.

Five new entries performed well in the demonstrations.

95-11-20 (Auski) was selected in both double-crop demonstrations as well as the November planted demonstration. Its selection in the July planted demonstration was based on its appearance and versatile cooking quality. In the February planted demonstration its appearance was not as good due to bumpy eyebrows but its cooking quality was outstanding, scoring three stars for each category (Table 9.4.10.2). 95-11-20 (Auski) was selected in both these demonstrations in the previous series (Table 9.3.10). 95-11-20 (Auski) was also selected in the November planted demonstration where, although its appearance was not ideal, it had good bloom and cooking quality. Auski was also selected in the October planted demonstration of the eleventh series of experiments (Table 9.2.6). The performance of 95-11-20 (Auski) is discussed in the Fresh market Discussion (Section 10.3) where a summary and discussion of results can be found.

95-37-12 (Billabong) was the best selection from the November planted demonstration with the best appearance and bloom. It was also selected in both the double-crop demonstrations. Its reaction to powdery scab also needs to be re-tested to confirm its tolerant reaction found in the single test done to date (Table 9.4.12.1). 95-37-12 (Billabong) is discussed in the Fresh market Discussion (Section 10.4) where a summary of all results can be found.

97-38-2 (White Star) was also selected in both the May and July planted demonstrations. Its best performance was in the former where it produced high yields of medium sized tubers (164g), Table 9.4.9) which appear to be tolerant of powdery scab (Table 9.4.9). 97-38-2 (White Star) is discussed in the Fresh market Discussion (Section 10.6) where a summary of all results can be found.

Maris Piper was also selected in the May planted demonstration where it produced tubers which appear to be tolerant of powdery scab (Table 9.4.9) and which are reported to have high resistant to PCN (*Globodera rostochiensis* race 1 & 5) (European Cultivated Potato Database 2001). This variety is discussed in the Fresh market Discussion (Section 10.2) where a summary of all results can be found.

Red Rascal was selected from the July planted demonstration where it had a darker skin colour than Ruby Lou. This is a privately owned variety and its further development in WA will depend on its owner.

Table 9.4.13 Thirteenth series fresh market entries selected in demonstrations with reasons for final selection or rejection shown.

Entry	Demon-stration	Powdery scab reaction (from Table 9.4.12.1 unless otherwise indicated).	Comments	Re-test?
Maris Piper	02AL39PE	tolerant		Yes
Red Rascal	02AL39BU1	tolerant	Not as versatile as Ruby Lou. Further testing requires agreement from *Crop & Food*.	No
90-40-1 (Ruby Lou)	02AL39PE	suscept	Standard variety	No
95-11-20 (Auski)	02AL39BU3 02AL39BU1 02AL39BU2	highly suscept. (Table 9.2.5.1)		Yes
95-37-12 (Billabong)	02AL39BU3 02AL39BU1 02AL39BU2	highly suscept.†		Yes
97-38-2 (White Star)	02AL39PE	tolerant		Yes

† one test only, needs to be confirmed.

9.5 Fourteenth or "98" series of fresh domestic & export market experiments

9.5.1. Background

Breeding lines of the "98" series from Agriculture Victoria's Potato Breeding Program were tested. Three screenings, four district trials and four demonstrations were completed.

9.5.2. Experiment 00BU1 – November 2000 planted unreplicated screening at Margaret River.

Aims

1. To select entries suitable for the fresh market in a November planting at Margaret River. The entries comprise 171 "98" series of Australian breeding lines plus four other earlier series breeding lines selected at the NPIC. These were compared with the standard varieties Atlantic, Coliban, Delaware, Desiree, Eureka, Mondial, Nadine, Ruby Lou, Russet Burbank, Shepody and Winter Gem.
2. To provide high quality seed for further tests.

Results

Eighty-seven entries were classified as fresh domestic market types (Table 9.5.2.1). Selections had suitable or questionable tuber characteristics with specific gravity of 1.064 or greater with after-cooking-darkening and sloughing both less than 4 and fry colour

Table 9.5.2.1 Tuber characteristics, yield and quality of fresh domestic market potato breeding lines in a November 2000 planted unreplicated screening at Margaret River. Selections in **bold** typeface.

Entry	Tuber* charact-eristics	SG	Yield >80g (t/ha)	Cook tests (NPIC 2000)			Final selection & notes
				Crisp# colour	Boil+ ACD	Boil+ Slough	
Coliban	**yes**	**1.068**	**37**	**6**	**2**	**3**	**Selected, standard**
Delaware	no	1.069	84	-	-	-	Not selected but standard
Desiree	no	1.070	76	6	2	3	Not selected but standard
Eureka	**yes**	**1.072**	**80**	**-**	**-**	**-**	**Selected, new hi SG standard**
Mondial	no	1.061	53	-	-	-	Not selected but standard
Nadine	yes	1.048	53	-	-	-	Not selected but standard
Ruby Lou	yes	1.063	35	6	3	2	Not selected but standard
Shepody	no	1.057	24	-	-	-	Not selected but standard
Winter Gem	no	1.055	39	-	-	-	Not selected but standard
93-3-15	**yes**	**1.064**	**80**	**-**	**-**	**-**	**Selected**
97-25-5	yes	1.063	30	-	-	-	Not selected SG < 1.064
97-86-40	no	-	-	-	-	-	Not selected U.S. tuber chars.
98-3-11	yes	1.060	80	7	1	2	Not selected SG < 1.064
98-3-19	yes	1.056	23	7	1	1	Not selected SG < 1.064
98-7-14	**?**	**1.070**	**25**	**6**	**1**	**2**	**Selected, good skin**
98-16-1	**yes**	**1.089**	**22**	**6**	**3**	**2**	**Selected**
98-17-7	no	-	-	-	-	-	Not selected U.S. tuber chars.
98-17-8	yes	1.056	27	5	2	3	Not selected SG < 1.064
98-21-9	**yes**	**1.078**	**38**	**2**	**1**	**1**	**Selected (v good cooking)**
98-22-8	no	-	-	-	-	-	Not selected U.S. tuber chars.
98-27-3	**yes**	**1.118**	**66**	**5**	**2**	**2**	**Selected, (SG too high?)**
98-29-2	yes	1.055	24	7	2	2	Not selected SG < 1.064
98-29-3	?	1.054	53	7	2	1	Not selected SG < 1.064
98-29-6	-	-	-	-	-	-	Rescreen (inadequate material to assess)
98-29-8	no	-	-	-	-	-	Not selected U.S. tuber chars.
98-29-12	no	-	-	-	-	-	Not selected U.S. tuber chars.
98-29-13	?	1.050	24	7	2	2	Not selected SG < 1.064
98-29-19	no	-	-	-	-	-	Not selected U.S. tuber chars.
98-30-2	no	-	-	-	-	-	Not selected U.S. tuber chars.
98-30-8	?	1.059	31	6	2	3	Not selected SG < 1.064
98-30-12	**?**	**1.082**	**37**	**6**	**3**	**3**	**Selected**
98-30-16	no	-	-	-	-	-	Not selected U.S. tuber chars.
98-31-22	**yes**	**1.066**	**33**	**6**	**2**	**3**	**Selected**
98-31-24	no	-	-	-	-	-	Not selected U.S. tuber chars.
98-32-4	**yes**	**1.067**	**38**	**4**	**3**	**2**	**Selected**
98-32-12	no	-	-	-	-	-	Not selected U.S. tuber chars.
98-32-19	no	-	-	-	-	-	Not selected U.S. tuber chars.
98-33-9	yes	1.053	23	7	2	1	Not selected SG < 1.064
98-33-16	no	-	-	-	-	-	Not selected U.S. tuber chars.
98-33-21	no	-	-	-	-	-	Not selected U.S. tuber chars.
98-33-22	no	-	-	-	-	-	Not selected U.S. tuber chars.
98-33-23	**yes**	**1.068**	**52**	**6**	**2**	**1**	**Selected**

*Tuber characteristics (tc); yes = suitable, ? = questionable, no = unsuitable

Crisp colour; scale 1 - 10 (light to dark), >7 unacceptable for French-fries.

+Boiling: ACD (after-cooking-darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy

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Table 9.5.2.1 continued. Tuber characteristics, yield and quality of fresh domestic market potato breeding lines in a November 2000 planted unreplicated screening at Margaret River. Selections in **bold** typeface.

Entry	Tuber* charact-eristics	SG	Yield >80g (t/ha)	Cook tests (NPIC 2000)			Final selection & notes
				Crisp# colour	Boil+ ACD	Boil+ Slough	
98-33-24	no	-	-	-	-	-	Not selected U.S. tuber chars.
98-33-28	no	-	-	-	-	-	Not selected U.S. tuber chars.
98-34-4	no	-	-	-	-	-	Not selected U.S. tuber chars.
98-34-8	**yes**	**1.075**	**46**	**6**	**3**	**2**	**Selected**
98-34-11	no	-	-	-	-	-	Not selected U.S. tuber chars.
98-38-22	yes	1.059	54	-	-	-	Not selected SG < 1.064
98-40-5	no	-	-	-	-	-	Not selected U.S. tuber chars.
98-40-14	no	-	-	-	-	-	Not selected U.S. tuber chars.
98-41-3	no	-	-	-	-	-	Not selected U.S. tuber chars.
98-41-5	no	-	-	-	-	-	Not selected U.S. tuber chars.
98-41-6	no	-	-	-	-	-	Not selected U.S. tuber chars.
98-41-12	no	-	-	-	-	-	Not selected U.S. tuber chars.
98-41-14	no	-	-	-	-	-	Not selected U.S. tuber chars.
98-49-10	no	-	-	-	-	-	Not selected U.S. tuber chars.
98-54-4	**yes**	**1.072**	**21**	**5**	**2**	**2**	**Selected**
98-54-5	yes	1.053	16	6	2	1	Not selected SG < 1.064
98-54-16	yes	1.059	16	7	2	2	Not selected SG < 1.064
98-54-28	**yes**	**1.064**	**10**	**7**	**1**	**2**	**Selected**
98-54-40	no	-	-	-	-	-	Not selected U.S. tuber chars.
98-54-41	yes	1.059	40	6	1	3	Not selected SG < 1.064
98-54-42	no	-	-	-	-	-	Not selected U.S. tuber chars.
98-54-44	no	-	-	-	-	-	Not selected U.S. tuber chars.
98-54-50	Rescreen - inadequate material to assess						
98-54-54	yes	1.060	28	3	1	2	Not selected SG < 1.064
98-54-59	**yes**	**1.065**	**35**	**5**	**2**	**2**	**Selected**
98-54-63	**yes**	**1.068**	**20**	**5**	**2**	**3**	**Selected**
98-59-9	**yes**	**1.067**	**40**	**2**	**1**	**3**	**Selected**
98-67-29	no	-	-	-	-	-	Not selected U.S. tuber chars.
98-76-5	yes	1.055	26	7	2	2	Not selected SG < 1.064
98-76-6	yes	1.059	42	6	3	3	Not selected SG < 1.064
98-76-9	no	-	-	-	-	-	Not selected U.S. tuber chars.
98-76-13	yes	1.060	42	7	3	2	Not selected SG < 1.064
98-76-14	no	-	-	-	-	-	Not selected U.S. tuber chars.
98-76-15	?	1.061	18	7	2	2	Not selected SG < 1.064
98-77-4	no	-	-	-	-	-	Not selected U.S. tuber chars.
98-77-7	no	-	-	-	-	-	Not selected U.S. tuber chars.
98-77-8	no	-	-	-	-	-	Not selected U.S. tuber chars.
98-79-11	no	-	-	-	-	-	Not selected U.S. tuber chars.
98-80-7	**yes**	**1.064**	**28**	**4**	**1**	**2**	**Selected**
98-80-11	**yes**	**1.073**	**37**	**5**	**1**	**2**	**Selected**
98-83-9	no	-	-	-	-	-	Not selected U.S. tuber chars.
98-88-7	yes	-	-	-	-	-	Not selected SG < 1.064
98-89-1	**yes**	-	-	-	-	-	**Selected**

*Tuber characteristics (tc); yes = suitable, ? = questionable, no = unsuitable

Crisp colour; scale 1 - 10 (light to dark), >7 unacceptable for French-fries.

+Boiling: ACD (after-cooking-darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy

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Table 9.5.2.1 continued. Tuber characteristics, yield and quality of fresh domestic market potato breeding lines in a November 2000 planted unreplicated screening at Margaret River. Selections in **bold** typeface.

Entry	Tuber* charact-eristics	SG	Yield >80g (t/ha)	Cook tests (NPIC 2000)			Final selection & notes
				Crisp# colour	Boil+ ACD	Boil+ Slough	
98-96-59	no	-	-	-	-	-	Not selected U.S. tuber chars.
98-107-13	**yes**	**1.084**	**69**	**5**	**2**	**3**	**Selected**
98-107-17	**yes**	**1.091**	**37**	**2**	**1**	**2**	**Selected**
98-107-18	no	-	-	-	-	-	Not selected U.S. tuber chars.
98-109-1	**yes**	**1.080**	**33**	**5**	**3**	**2**	**Selected**
98-110-6	**yes**	**1.069**	**29**	**6**	**3**	**2**	**Selected**
98-116-2	**yes**	-	-	-	-	-	**Selected**
98-120-6	no	-	-	-	-	-	Not selected U.S. tuber chars.
98-120-23	no	-	-	-	-	-	Not selected U.S. tuber chars.
98-123-11	no	-	-	-	-	-	Not selected U.S. tuber chars.
98-125-6	no	-	-	-	-	-	Not selected U.S. tuber chars.

*Tuber characteristics (tc); yes = suitable, ? = questionable, no = unsuitable
Crisp colour; scale 1 - 10 (light to dark), >7 unacceptable for French-fries.
+Boiling: ACD (after-cooking-darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy

Table 9.5.2.2 Tuber characteristics of unclassified market potato breeding lines in a November 2000 planted unreplicated screening at Margaret River.

Entry	Tuber* charact-eristics	Final selection & notes	Entry	Tuber* charact-eristics	Final selection & notes
87-12-6	no		98-33-18	no	
98-1-3	no		98-33-46	no	
98-1-12	no		98-34-1	no	
98-3-6	no		98-34-2	no	
98-3-12	no		98-54-43	no	
98-3-16	no		98-56-1	no	
98-3-17	no		98-57-9	no	Yes, grower's selection
98-4-3	no		98-60-6	no	Yes, grower's selection
98-7-1	no		98-60-8	no	
98-7-17	no		98-60-10	no	
98-11-14	no		98-67-26	no	
98-12-32	no		98-74-2	no	
98-20-36	no		98-74-6	no	
98-20-62	no		98-74-8	no	
98-21-2	no		98-76-4	no	
98-22-4	no		98-76-7	no	
98-22-5	no		98-80-2	no	
98-26-4	-	rescreen	98-83-3	no	
98-27-6	no		98-83-12	no	
98-31-2	no		98-88-24	no	
98-31-3	no		98-108-3	no	

*Tuber characteristics (tc); yes = suitable, ? = questionable, no = unsuitable.

lighter than 8. The 23 selections for further testing in next season's replicated screening are shown in bold typeface in Table 9.5.2.1.

No entries were classified as fresh export market types.

Forty-two selections were not classified into any market type and these unclassified breeding lines are shown in Table 9.5.2.2. Two of these entries, 98-57-9 and 98-60-6, were chosen for further testing as they were the industry representative's selections from the NPIC selection trip.

These selections will be re-tested next season in a replicated screening. They will be tested with additional selections that will be made from the following May planted winter screening (see next section).

9.5.3. Experiment 01PE7 - May 2001 planted unreplicated screening at Baldivis.

Aims

To select entries suitable for the fresh market in a May planting from the "98" series of breeding lines selected at the NPIC and other varieties described for Experiment 00BU1 (see previous section).

Fresh market selections

130 entries were classified as fresh market types (Table 9.5.3). To be selected entries had to have suitable tuber characteristics with crisp colour (fry score) lighter than 8 and after-cooking-darkening and slough scores better than 3. The twelve selections were 98-4-5, 98-20-28, 98-20-44, 98-27-3, 98-34-11, 98-40-5, 98-54-28, 98-54-33, 98-77-7, 98-107-12, 98--107-13 and 98-109-1. These are shown in bold in Table 9.5.3.

Export fresh market selections

No entries were classified as export fresh market types as none had yellow flesh.

Selections for further testing from both summer and winter unreplicated screenings are shown in Table 9.5.4.

Table 9.5.3. Quality and yield of domestic fresh market potato breeding lines in a May 2001 planted unreplicated screening at Baldivis. Selections shown in bold.

Entry	Tuber* characteristics	SG	Yield >80g (t/ha)	Cooking tests			Flesh faults (%)	Final selection & notes
				Crisp# colour	Boil+ ACD	Boil+ Slough		
Coliban	no	1.062	44	8	1	1	0	
Delaware	?	1.057	66	7	1	1.5	0	
Desiree	?	1.060	54	7	1	1	0	
Eureka	yes	1.068	59	6	1	1	0	
Mondial	yes	1.054	87	8	1	1	0	
Nadine	yes	1.049	43	10	1	1	0	
Ruby Lou	yes	1.067	90	3	1	1	0	
Shepody	no	1.064	47	8	1	1.5	0	
Winter Gem	yes	1.059	72	8	1.5	1	20	
87-12-6	no	-	-	-	-	-	-	no tc
93-3-15	no	-	-	-	-	-	-	no tc
97-25-5	?	1.060	28	8	2	2	0	no crisp colour
97-69-5	no	-	-	-	-	-	-	no tc
97-86-40	?	1.069	50	8	1	1	0	no crisp colour
98-1-3	no	-	-	-	-	-	-	no tc
98-1-12	no	-	-	-	-	-	-	no tc
98-3-5	no	-	-	-	-	-	-	no tc
98-3-6	no	-	-	-	-	-	-	no tc
98-3-11	?	1.065	68	8	1	2	0	no crisp colour
98-3-12	no	-	-	-	-	-	-	no tc
98-3-17	no	-	-	-	-	-	-	no tc
98-3-19	no	-	-	-	-	-	-	no tc
98-4-3	yes	1.066	57	8	1	2	0	no crisp colour
98-4-5	yes	1.053	115	8	1	2	0	yes despite SG because of yield
98-7-1	no	-	-	-	-	-	-	no tc
98-7-14	?	1.064	53	8	1	2	0	no crisp colour
98-10-6	no	-	-	-	-	-	-	no tc
98-12-18	no	-	-	-	-	-	-	no tc
98-12-24	no	-	-	-	-	-	-	no tc
98-12-32	no	-	-	-	-	-	-	no tc
98-16-1	no	-	-	-	-	-	-	no tc
98-17-7	no	-	-	-	-	-	-	no tc
98-17-8	no	-	-	-	-	-	-	no tc
98-20-5	no	-	-	-	-	-	-	no tc
98-20-28	yes	1.073	65	5	2	2	0	yes
98-20-32	no	-	-	-	-	-	-	no tc
98-20-42	no	-	-	-	-	-	-	no tc
98-20-44	yes	1.079	37	2	1	1	0	yes
98-21-2	no	-	-	-	-	-	-	no tc
98-21-9	no	-	-	-	-	-	-	no tc
98-22-4	no	-	-	-	-	-	-	no tc
98-22-5	no	-	-	-	-	-	-	no tc
98-22-8	no	-	-	-	-	-	-	no tc
98-27-3	yes	1.067	35	3	1	2	0	yes
98-29-2	?	1.051	32	8	1	1	0	no sg & crisp colour

*Tuber characteristics; Yes = suitable, ? = questionable, no = unsuitable

#Crisp colour: 1-10, >7 too dark

+Boiling: ACD (after-cooking-darkening): 1 = nil, 3 = moderate, 5=general blackening
Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy

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Table 9.5.3 continued Quality and yield of domestic fresh market potato breeding lines in a May 2001 planted unreplicated screening at Baldivis. Selections shown in bold.

Entry	Tuber* charact-eristics	SG	Yield >80g (t/ha)	Cooking tests			Flesh faults (%)	Final selection & notes
				Crisp# colour	Boil+			
					ACD	Slough		
98-29-3	yes	1.050	62	8	1	1	0	no sg & crisp colour
98-29-8	?	1.046	26	8	2	1	20	no sg & crisp colour
98-29-12	no	-	-	-	-	-	-	no tc
98-29-13	yes	1.052	55	8	1	1	0	no sg & crisp colour
98-29-19	yes	1.050	51	9	2	1	20	no sg &crisp colour
98-30-2	no	-	-	-	-	-	-	no tc
98-30-12	no	-	-	-	-	-	-	no tc
98-30-16	no	-	-	-	-	-	-	no tc
98-31-2	yes	1.063	58	8	1	2	0	no crisp colour
98-31-6	yes	1.065	52	8	1	1	0	no crisp colour
98-31-22	no	-	-	-	-	-	-	no tc
98-31-24	no	-	-	-	-	-	-	no tc
98-32-4	yes	1.061	38	9	1	1	0	no crisp colour
98-32-12	?	1.078	49	7	1	1	0	no ? tc
98-32-19	no	-	-	-	-	-	-	no tc
98-33-9	?	1.055	36	9	1	1	20	no sg &crisp colour
98-33-16	no	-	-	-	-	-	-	no tc
98-33-21	no	-	-	-	-	-	-	no tc
98-33-22	no	-	-	-	-	-	-	no tc
98-33-23	no	-	-	-	-	-	-	no tc
98-33-24	no	-	-	-	-	-	-	no tc
98-33-27	no	-	-	-	-	-	-	no tc
98-34-1	?	1.069	39	5	2	2	0	no ? tc (skin too pale)
98-34-2	?	1.058	31	4	2	1	0	no ? tc (skin too pale)
98-34-4	no	-	-	-	-	-	-	no tc
98-34-8	?	1.060	26	3	1	1	0	no ? tc (skin too pale)
98-34-11	yes	1.059	49	5	1	1	0	yes
98-37-1	no	-	-	-	-	-	-	no tc
98-37-22	no	-	-	-	-	-	-	no tc
98-38-22	no	-	-	-	-	-	-	no tc
98-40-5	yes	1.073	37	6	1	2	0	yes
98-40-14	no	-	-	-	-	-	-	no tc
98-41-3	?	1.071	26	8	2	3	0	no bad cooking
98-41-5	yes	1.070	39	6	1	4	0	no slough
98-41-6	?	1.070	47	8	1	2	0	no crisp colour
98-41-12	no	-	-	-	-	-	-	no tc
98-41-14	no	-	-	-	-	-	-	no tc
98-49-5	no	-	-	-	-	-	-	no tc
98-49-10	no	-	-	-	-	-	-	no tc
98-49-21	no	-	-	-	-	-	-	no tc
98-54-4	no	-	-	-	-	-	-	no tc
98-54-5	yes	1.051	54	9	1	1	0	no sg & crisp colour
98-54-16	yes	1.057	43	8	1	1	0	no crisp colour
98-54-28	yes	1.062	22	7	1	2	0	yes
98-54-33	yes	1.062	45	7	1	1.5	0	yes

*Tuber characteristics; Yes = suitable, ? = questionable, no = unsuitable
#Crisp colour: 1-10, >7 too dark
+Boiling: ACD (after-cooking-darkening): 1 = nil, 3 = moderate, 5=general blackening
Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy

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Table 9.5.3 continued Quality and yield of domestic fresh market potato breeding lines in a May 2001 planted unreplicated screening at Baldivis. Selections shown in bold.

Entry	Tuber* charact-eristics	SG	Yield >80g (t/ha)	Cooking tests			Flesh faults (%)	Final selection & notes
				Crisp# colour	Boil+			
					ACD	Slough		
98-54-40	yes	1.058	39	8	1	1	0	no crisp colour
98-54-41	?	1.057	38	8	1	1	0	no crisp colour
98-54-42	no	-	-	-	-	-	-	no tc
98-54-44	yes	1.058	47	8	1	1	0	no crisp colour
98-54-54	yes	1.060	34	8	1	1	0	no crisp colour
98-54-59	?	1.062	41	6	1	2.5	0	no ? tc
98-54-63	?	1.059	34	5	1	1.5	0	no ? tc
98-56-1	no	-	-	-	-	-	-	no tc
98-57-9	?	1.065	30	6	1	1	0	no ? tc
98-59-9	?	1.068	25	5	1	1	0	no ? tc
98-60-6	no	-	-	-	-	-	-	no tc
98-60-8	no	-	-	-	-	-	-	no tc
98-60-10	no	-	-	-	-	-	-	no tc
98-67-26	no	-	-	-	-	-	-	no tc
98-67-29	no	-	-	-	-	-	-	no tc
98-74-6	no	-	-	-	-	-	-	no tc
98-74-8	no	-	-	-	-	-	-	no tc
98-76-6	no	-	-	-	-	-	-	no tc
98-76-7	no	-	-	-	-	-	-	no tc
98-76-9	?	1.056	23	7	1.5	1.5	0	no sg
98-76-13	yes	1.053	34	9	1	1	0	no sg & crisp colour
98-76-14	no	-	-	-	-	-	-	no tc
98-76-15	no	-	-	-	-	-	-	no tc
98-77-6	?	1.074	28	4	1	1.5	0	no ? tc
98-77-7	yes	1.068	23	6	1	1.5	0	yes
98-77-8	yes	1.061	23	8	1	1	0	no crisp colour
98-77-9	no	-	-	-	-	-	-	no tc
98-79-11	no	-	-	-	-	-	-	no tc
98-80-7	?	1.060	28	8	1	1	0	no crisp colour
98-83-3	no	-	-	-	-	-	-	no tc
98-83-9	yes	1.060	48	8	1	1	20	no crisp colour
98-88-4	no	-	-	-	-	-	-	no tc
98-88-7	no	-	-	-	-	-	-	no tc
98-88-24	no	-	-	-	-	-	-	no tc
98-89-1	no	-	-	-	-	-	-	no tc
98-96-59	yes	1.072	26	8	1	1	0	no crisp colour
98-102-23	no	-	-	-	-	-	-	no tc
98-107-1	no	-	-	-	-	-	-	no tc
98-107-11	?	1.059	28	5	1	1	0	no tc
98-107-12	yes	1.069	50	6	1	1	0	yes
98-107-13	yes	1.073	41	3	2	3	0	yes
98-107-17	no	-	-	-	-	-	-	no tc
98-107-18	no	-	-	-	-	-	-	no tc

*Tuber characteristics; Yes = suitable, ? = questionable, no = unsuitable

#Crisp colour: 1-10, >7 too dark

+Boiling: ACD (after-cooking-darkening): 1 = nil, 3 = moderate, 5=general blackening
Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy

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Table 9.5.3 continued Quality and yield of domestic fresh market potato breeding lines in a May 2001 planted unreplicated screening at Baldivis. Selections shown in bold.

Entry	Tuber* charact-eristics	SG	Yield >80g (t/ha)	Cooking tests			Flesh faults (%)	Final selection & notes
				Crisp# colour	Boil+			
					ACD	Slough		
98-109-1	yes	1.069	40	6	1.5	1	0	yes
98-110-6	no	-	-	-	-	-	-	no tc
98-112-2	no	-	-	-	-	-	-	no tc
98-120-6	no	-	-	-	-	-	-	no tc
98-120-23	no	-	-	-	-	-	-	no tc
98-125-6	no	-	-	-	-	-	-	no tc

*Tuber characteristics; Yes = suitable, ? = questionable, no = unsuitable
#Crisp colour: 1-10, >7 too dark
+Boiling: ACD (after-cooking-darkening): 1 = nil, 3 = moderate, 5=general blackening
Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy

9.5.4. Experiment 01BU2 – November 2001 planted replicated screening at Margaret River.

Background

This screening contained breeding lines selected for crisp, French-fry, fresh and export markets.

Aims

1. To select entries for district trials. Additional selection pressure will be applied compared to the unreplicated screening (Section 9.5.2) to further reduce the numbers. This additional selection pressure will only be applied to summer selections. Entries which were selected for their winter performance will be tested in district trials without regard for their performance in this summer screening.
2. To bulk seed of the lines selected in the previous screenings.

Results

Fresh market

Yield and quality data are shown in Table 9.5.4. Good growth is indicated by Delaware's high Grade 1 yield of 87 t/ha. Of the 53 breeding lines tested 30 were categorised as fresh market types. Selections had suitable tuber characteristics, specific gravity not significantly less than Delaware (i.e. 1.066 or greater), yield greater then 43.8 t/ha {not highly significantly less than Nadine (P= 0.01)} with fry colour less than 8, after-cooking-darkening and slough not significantly greater than Delaware (4 and 3 respectively) with internal disorders not significantly greater than Delaware. Coloured varieties had to have dark coloured skin and had to pass a skinning test. Selections were 98-31-22, 98-32-4, 98-33-28 (also selected as a crisp - Section 5.5.4), 98-57-9, 98-80-11, 98-109-1 (also selected as a French-fry - Section 7.4.3), 98-110-6 and 98-116-2.

Export market

Four other entries were selected even though they did not meet the selection criteria. These were varieties with potential for the export seed market: Eben, KT3, PO3 and TK 51.6.

Winter selections

Winter performance must be considered when selecting material for district trials. Twelve additional selections from the winter screening (see previous section) were: 98-4-5, 98-20-28, 98-20-44, 98-27-3, 98-34-11, 98-40-5, 98-54-28, 98-54-33, 98-77-7, 98-107-12, 98-107-13 and 98-109-1 (also summer selection).

Further testing of selections

These selections will be tested in a series of district trials reported in Sections 9.5.5 to 9.5.7.

Table 9.5.4. Yield and quality of fresh market entries in a November 2001 planted replicated screening at Margaret River.

Planted: 1 November 2001 Harvested: 20 March 2002 Soil type: loam
Row spacing: 76 cm Soil temp. at harvest: 20°C Elevation: 100 m

Entry, tuber* characteristics and spacing (cm)		Yield (t/ha)						Rank by Grade No.1	Tuber no. per plant	Quality			
		Chats 0-70g	Small 70-200g	Med-ium 200-350g	Large 350-450g	Grade No. 1 70-450g	Over size >450g			SG	ACD @	Slough ~	Fry# colour
Coliban	15	2.4	7.0	59.8	12.3	79.1	4.9	13	6.3	1.070	3.0	2.3	4.0
Delaware	15	5.7	15.5	69.7	2.2	87.3	0.5	5	8.5	1.070	2.8	2.0	5.0
Desiree	20	4.2	19.8	78.7	3.1	101.5	0.5	2	11.2	1.071	1.3	1.3	7.0
Eben	24	6.3	18.3	30.9	1.9	51.0	0.5	36	9.2	1.072	3.5	2.5	4.0
Eureka	20	3.3	8.0	68.6	7.3	83.9	3.8	9	8.4	1.077	4.3	3.0	4.5
KT3	24	6.4	14.8	62.7	5.1	82.6	1.7	10	12.7	1.061	3.0	1.3	7.0
Mondial	15	8.2	20.7	83.0	3.7	107.4	3.1	1	11.1	1.067	3.5	2.8	7.5
Nadine	24	8.2	19.9	46.1	3.6	69.6	3.5	22	13.5	1.050	2.0	1.3	9.0
PO3	24	4.9	11.2	42.2	4.5	57.9	1.6	31	9.0	1.078	3.3	1.5	5.0
Redstar	24	4.6	14.7	60.5	2.5	77.6	0.0	14	11.8	1.074	2.5	1.3	5.0
Ruby Lou	20	8.1	26.7	57.3	1.4	85.4	0.4	7	12.9	1.067	1.5	1.0	4.5
Russet Burbank	40	5.1	15.1	45.0	2.0	62.1	0.4	26	16.4	1.075	2.5	2.8	6.0
Shepody	30	2.9	5.9	42.5	2.5	50.9	3.5	37	7.8	1.063	2.8	1.8	5.0
VC51.6	24	20.3	11.8	6.4	0.0	18.2	0.0	44	15.4	1.073	3.5	1.3	8.0
93-3-15	24	2.9	13.5	68.7	4.4	86.7	0.9	6	10.6	1.060	1.5	1.5	7.5
98-4-5	24	5.9	13.5	59.0	3.1	75.6	0.0	17	11.8	1.060	2.3	1.5	6.5
98-7-14	24	3.4	25.5	39.8	0.0	65.3	0.0	24	12.1	1.071	2.0	1.8	5.0
98-16-1	30	2.1	6.5	37.3	4.8	48.6	5.2	40	8.1	1.088	3.5	3.5	6.5
98-21-9	36	6.9	20.2	31.4	0.3	51.9	0.0	33	17.0	1.073	2.0	1.0	7.0
98-27-3	24	2.9	7.2	48.9	9.2	65.2	8.3	25	9.6	1.074	4.3	1.8	5.0
98-30-12	24	5.4	13.7	56.8	1.5	72.1	0.0	19	10.1	1.081	4.8	4.0	5.5
Significance+		skew	***	***	skew	***	skew		***	***	***	***	**
LSD P = 0.05			7.4	17.4		19.3			2.5	0.005	1.2	1.0	2.5
LSD P = 0.01						25.8							

* Tuber characteristics: **bold** typeface = suitable, plain type = questionable, *italic* = unsuitable.
@ ACD (after-cooking-darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
~ Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy.
# Samples assessed visually: 1 - 10, 7 = borderline, >7 = too dark.
+ "skew" indicates data did not fulfil assumptions of analysis of variance.

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Table 9.5.4 continued. Yield and quality of fresh market entries in a November 2001 planted replicated screening at Margaret River.

Planted: 1 November 2001 Harvested: 20 March 2002 Soil type: loam
Row spacing: 76 cm Soil temp. at harvest: 20°C Elevation: 100 m

Entry, tuber* characteristics and spacing (cm)		Yield (t/ha)						Rank by Grade No.1	Tuber no. per plant	Quality			
		Chats 0-70g	Small 70-200g	Med-ium 200-350g	Large 350-450g	Grade No. 1 70-450g	Over size >450g			SG	ACD @	Slough ~	Fry# colour
98-31-22	24	2.6	7.8	43.9	22.9	74.6	25.0	18	9.7	1.072	3.3	1.5	6.5
98-32-4	24	3.3	9.1	61.7	6.8	77.5	1.8	15	9.6	1.066	2.5	1.0	6.0
98-32-12	24	5.7	14.7	60.6	5.9	81.1	1.9	11	10.9	1.089	4.0	3.0	6.5
98-33-28	30	9.7	26.1	43.8	0.0	69.9	0.0	21	17.0	1.076	2.0	1.0	3.0
98-34-1	24	11.0	23.3	29.8	0.0	53.1	0.0	32	12.5	1.069	3.5	1.0	5.5
98-34-11	24	10.7	20.3	60.4	3.6	84.3	1.0	8	15.2	1.071	3.8	1.3	5.0
98-40-5	24	9.8	26.5	13.4	0.0	40.0	0.0	43	12.2	1.064	4.5	1.0	5.0
98-54-4	24	4.0	15.8	51.0	2.6	69.4	1.5	23	10.3	1.064	2.8	1.5	4.5
98-54-28	30	8.9	19.9	25.4	0.0	45.3	0.0	41	13.5	1.064	2.8	1.8	6.5
98-54-59	24	9.2	28.1	31.4	0.4	59.9	0.0	29	13.1	1.067	1.8	1.8	4.5
98-54-63	24	13.7	31.8	28.5	0.0	60.3	0.5	28	17.0	1.063	2.0	2.8	6.0
98-57-9	24	4.5	10.8	38.3	0.0	49.1	0.0	38	9.3	1.066	2.5	1.5	6.0
98-59-9	30	5.5	10.1	41.6	0.0	51.6	0.0	34	11.6	1.066	2.5	1.8	5.5
98-60-6	24	2.1	7.3	69.6	11.1	88.0	4.2	4	8.9	1.086	4.3	3.5	5.5
98-77-7	30	2.5	9.0	38.1	1.5	48.6	0.5	39	8.4	1.075	3.5	2.0	3.5
98-80-11	30	15.7	37.0	22.2	0.0	59.2	0.0	30	20.6	1.065	2.3	1.0	4.5
98-89-1	30	6.7	12.3	29.2	0.4	41.9	0.0	42	10.5	1.066	2.3	1.0	4.0
98-107-12	24	5.8	18.0	55.8	2.4	76.2	0.0	16	11.4	1.072	2.0	2.8	5.0
98-107-13	24	1.0	4.5	66.9	17.3	88.7	10.7	3	8.6	1.082	3.0	3.8	4.5
98-107-17	24	7.2	22.3	56.8	0.8	80.0	0.0	12	12.9	1.090	3.0	4.0	3.5
98-109-1	24	7.7	18.5	52.0	0.8	71.2	0.0	20	12.9	1.074	3.8	1.0	3.5
98-110-6	24	21.5	31.8	28.9	0.0	60.7	0.0	27	17.8	1.069	3.8	1.0	4.0
98-116-2	30	13.6	30.6	20.9	0.0	51.5	0.0	35	18.6	1.070	2.3	2.0	4.0
Significance+		skew	***	***	skew	***	skew		***	***	***	***	**
LSD P = 0.05			7.4	17.4		19.3			2.5	0.005	1.2	1.0	2.5
LSD P = 0.01						25.8							

* Tuber characteristics: **bold** typeface = suitable, plain type = questionable, *italic* = unsuitable.
@ ACD (after-cooking-darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
~ Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy.
# Samples assessed visually: 1 - 10, 7 = borderline, >7 = too dark.
+ "skew" indicates data did not fulfil assumptions of analysis of variance.

9.5.5. Experiment 02AL37PE – May planted district trial at Mandogalup.

Aim

To select entries suited to fresh market production from a May planting. Early maturing, high yielding varieties that produce large tubers with versatile cooking quality and tolerance to powdery scab are required for this time of year.

Results

Yield and quality data are shown in Table 9.5.5. The trial grew well through hard, windy, cold conditions. Several entries had poor emergence. Delaware, the standard had 100% emergence while 98-80-11 had 39%, 98-77-7 had 47%, KT3 had 54%, Coliban had 68%, 98-116-2 had 69%, 98-107-13 had 70%, Eureka had 74%, 98-32-4 had 76%, 98-54-28 had 77% and 98-107-12 had 82%. There were also large amounts of internal disorders in some varieties (see Table 9.5.5). Selection criteria were: suitable tuber characteristics, yield not highly significantly less than Delaware (>54.9 t/ha), tuber size significantly greater than Delaware (>183g), specific gravity not significantly less than Delaware (>1.067), sloughing not significantly greater than Delaware, fry colour significantly less than Nadine (<9.5), tolerance to powdery scab with no major faults. There were no selections: 98-34-11 was nearly chosen as it met 6 of the selection criteria but suffered 27% hollow heart.

9.5.6 Experiments 02AL37BUA&B – July and February planted district trials at Jindong.

Aim

The aim is to select varieties suited to spring production. The current standard is Nadine.

Results

July selections

The trial did not close probably due to a combination of pesticide phytotoxicity and insufficient fertiliser. Yield and quality data are shown in Table 9.5.6.1. Selections need to have suitable appearance (tuber characteristics), specific gravity significantly greater than Nadine (> 1.057) with versatile cooking quality. This means acceptable after-cooking-darkening and slough (<2.5) and acceptable fry colour (<8). High yields and no major faults are also required. However due to the poor growth yield was not used as a selection criterion. 15 entries had suitable tuber characteristics, of these nine met the other selection criteria. Two of these were 89-12-1 (Eureka)(already undergoing commercial tests) and 90-40-1 (Ruby Lou), now the standard red variety in WA. The seven new selections were PO3, 98-4-5, 98-34-11, 98-77-6, 98-77-7, 98-107-13 and 98-109-1.

February selections

The demonstration was severely damaged by cattle just before row closure. After this damage the trial didn't close, didn't grow well and died early. Yield and quality data are shown in Table 9.5.6.2. Yields were low and so yield was not used as a selection criterion. Selections had suitable tuber characteristics, acceptable boil and fry quality with no major faults. Selections were Coliban and PO3. PO3 was also selected in the previous July trial.

Selections from both times of planting

PO3 was the only entry selected at both times of planting.

Table 9.5.5. Yield and quality of fresh market entries in a May 2002 planted district trial at Mandogalup.

Planted: 17 May 2002 | Harvested: 17 October 2002 | Soil type: alkaline sand
Row spacing: 70 cm | Soil temp. at harvest: 19°C | Elevation: 20 m

Entry tuber* characteristics & spacing in rows (cm)		Yield (t/ha)					Rank by Grade No.1	Tuber		Quality					
		Small 70-120g	Medium 120-350g	Large 350-450g	Grade No. 1 70-450g	Oversize >450g		no. per plant	av mkt wt (g)	SG	ACD @	Slough ing~	Fry# color	Flesh faults (%)†	Pwd scab tol‡
Selection criteria															
Suitable					>54.9				>183	>1.067		<3.6	<9.5	<17	tol
Coliban	15	7.3	35.4	0.9	43.6	0.0	10	5.5	164	1.070	1.0	1.8	6.7	0	-
Delaware	24	12.2	50.2	2.4	64.8	0.0	1	8.5	158	1.071	1.0	2.7	7.7	0	-
Eben	24	8.9	28.9	3.9	41.6	2.0	12	7.3	165	1.080	2.2	2.8	5.0	0	tol
Eureka	24	4.7	34.2	3.0	41.9	2.8	11	6.2	202	1.076	1.5	2.5	4.0	0	-
KT3	24	4.4	44.0	7.2	55.6	0.7	7	11.3	207	1.054	1.2	1.2	8.7	63†	h sus
Mondial	15	5.3	40.4	9.8	55.5	12.6	8	5.4	246	1.061	1.0	1.7	8.0	0	-
Nadine	24	6.7	26.1	3.8	36.6	2.6	14	6.3	165	1.054	1.3	1.0	10.0	0	tol
PO3	24	5.8	38.4	11.9	56.1	15.5	6	7.7	236	1.074	1.3	2.3	8.0	17†	h sus
Ruby Lou	20	8.1	45.2	4.2	57.5	1.2	4	5.9	180	1.073	1.0	2.5	4.7	7	-
TK51.6	24	10.1	22.9	0.6	33.7	1.0	18	7.2	143	1.074	2.2	3.5	7.7	93†	tol
98-4-5	24	6.3	44.7	9.7	60.6	3.3	2	8.0	206	1.059	1.0	2.0	8.0	0	h sus
98-27-3	30	9.3	45.9	2.0	57.2	0.4	5	11.3	166	1.076	1.8	2.3	5.7	0	h sus
98-31-22	20	7.6	32.9	3.1	43.7	2.1	9	6.2	174	1.075	1.2	2.8	6.0	0	h sus
98-32-4	24	4.3	27.4	4.4	36.1	2.1	16	5.8	201	1.072	1.0	2.5	7.0	20†	h sus
98-33-27	24	10.6	21.1	0.3	32.0	0.0	20	8.1	123	1.080	1.0	3.3	6.3	3	h sus
98-33-28	36	9.6	17.0	0.0	26.6	0.0	24	8.4	126	1.088	1.0	2.0	5.0	0	sus
98-33-30	30	5.7	18.5	1.1	25.3	0.0	25	5.6	149	1.087	1.2	4.2	5.0	3	sus
98-33-58	30	5.1	23.5	0.3	28.8	0.0	22	5.8	157	1.092	2.2	2.7	5.3	10	h sus
98-34-11	24	8.1	43.1	7.2	58.3	4.5	3	8.2	191	1.065	1.0	2.0	6.7	27†	tol
98-40-5	30	7.1	25.8	0.5	33.4	0.0	19	7.0	152	1.083	1.8	2.5	5.7	0	sus
98-54-28	36	4.8	12.1	0.3	17.1	0.0	29	7.2	141	1.070	1.0	1.8	9.0	0	h sus
98-54-33	30	9.7	16.9	0.0	26.6	0.0	23	10.6	124	1.075	1.7	3.0	7.7	7	tol
98-57-9	30	7.5	17.6	0.0	25.1	0.0	26	6.0	134	1.076	1.0	1.7	7.7	0	tol
98-77-6	30	7.1	31.5	0.9	39.5	0.4	13	7.7	163	1.084	1.0	2.8	5.0	10	tol
98-77-7	30	2.6	14.8	1.4	18.8	1.4	28	6.7	182	1.078	1.8	3.0	7.0	27†	tol
98-80-11	40	3.0	11.0	0.5	14.6	0.0	30	10.1	152	1.076	1.5	2.3	5.7	47†	sus
98-107-12	24	8.6	15.9	0.6	25.1	0.0	27	23.7	137	1.077	1.0	2.5	7.3	0	h sus
98-107-13	24	3.8	27.8	3.0	34.6	0.4	17	4.7	199	1.081	1.8	3.5	5.7	0	h sus
98-109-1	30	6.9	23.6	0.3	30.7	0.3	21	7.4	148	1.076	1.2	1.5	5.3	0	tol
98-110-6	36	9.6	25.1	1.6	36.3	0.0	15	8.1	139	1.074	2.0	3.0	6.7	27†	sus
98-116-2	40	4.6	4.6	0.0	9.3	0.0	31	5.2	118	1.080	1.2	3.0	4.0	0	tol
Significance+		***	***	skew	***	skew		skew	***	***	skew	***	***		***
LSD P = 0.05			3.4	6.7		7.5			25	0.004		0.9	0.5		
LSD P = 0.01						9.9									

* Tuber characteristics: **bold** typeface = suitable, plain type = questionable, *italic* = unsuitable.
@ ACD (after-cooking-darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
~ Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy.
# Samples assessed visually after crisping: 1 - 10, 7 = borderline, >7 = too dark for domestic French-fries.
† Flesh faults; † indicates significantly greater faults compared with Delaware.
‡ Powdery scab reaction: tol = tolerant, sus = susceptible h = highly, Data from disease screening (See page ?)
+ "skew" indicates data did not fulfil assumptions of analysis of variance.

Table 9.5.6.1. Yield and quality of fresh market entries in a July 2002 planted district trial at Jindong.

Planted: 2 July 2002 | Harvested: 28 November 2002 | Soil type: clay loam
Row spacing: 75 cm | Soil temp. at harvest: 19°C | Elevation: 40 m

Entry tuber* characteristics & spacing in rows (cm)		Yield (t/ha)						Rank by Grade No.1	Tuber no. per plant	Quality				
		Chats 0-70g	Small 70-120g	Medium 120-350g	Large 350-450g	Grade No. 1 70-450g	Oversize >450g			SG	ACD @	Slough ing~	Fry# color	Flesh faults (%)†
Selection criteria														
Suitable										>1.078	<4.5			
Coliban	15	6.0	15.0	8.8	0.0	23.9	0.0	8	4.5	1.062	1.2	1.0	7.0	3
Delaware	24	16.3	14.5	0.7	0.0	15.3	0.0	20	9.6	1.059	1.2	1.0	7.3	0
Eben	24	10.9	14.2	9.2	0.0	23.4	0.0	9	8.6	1.068	2.0	1.8	6.0	0
Eureka	20	10.2	18.5	7.4	0.0	25.9	0.0	7	7.1	1.070	1.5	1.3	4.3	0
KT3	24	2.1	9.7	35.7	0.0	45.4	0.0	1	6.8	1.060	1.5	1.2	7.3	23†
Mondial	15	4.3	15.2	28.6	0.8	44.5	0.3	2	5.3	1.054	1.0	1.0	7.3	0
Nadine	24	10.8	17.5	5.7	0.0	23.2	0.0	11	8.5	1.054	1.0	1.0	10.0	0
PO3	24	7.1	17.1	24.4	0.2	41.7	0.0	3	8.8	1.066	1.5	1.0	6.0	7
Ruby Lou	20	9.0	19.1	10.2	0.0	29.4	0.0	6	7.4	1.065	1.7	1.0	4.3	0
TK51.6	24	6.3	11.8	19.0	0.0	30.8	0.0	5	7.7	1.070	3.0	2.2	9.0	77†
98-4-5	24	12.1	16.8	4.0	0.0	20.9	0.0	14	9.1	1.059	1.0	1.5	6.7	0
98-10-11	24	11.4	14.5	4.7	0.0	19.1	0.0	15	8.4	1.075	1.5	1.5	4.7	0
98-20-28	24	14.7	12.9	0.8	0.0	13.7	0.0	22	8.3	1.073	1.5	1.0	4.7	0
98-27-3	30	9.7	12.2	3.5	0.0	15.8	0.0	17	9.1	1.069	2.3	1.2	3.7	0
98-31-22	20	6.2	12.6	10.7	0.0	23.3	0.0	10	5.2	1.064	1.8	1.2	8.0	0
98-32-4	24	4.3	12.9	9.6	0.0	22.5	0.0	12	5.3	1.062	1.3	1.0	7.7	3
98-33-58	30	4.2	10.2	5.4	0.0	15.6	0.0	19	5.3	1.085	2.7	1.2	4.7	0
98-34-11	24	8.5	15.9	17.8	0.0	33.7	0.0	4	8.8	1.066	1.5	1.5	5.7	10
98-40-5	30	3.2	5.6	8.6	0.0	14.1	0.0	21	5.4	1.074	3.8	1.2	6.0	13†
98-54-28	36	11.0	9.2	0.9	0.0	10.1	0.0	26	8.8	1.063	1.8	1.2	8.0	0
98-54-33	30	17.6	8.4	1.3	0.0	9.7	0.0	27	11.8	1.064	1.5	1.2	7.3	10
98-57-9	30	7.6	7.3	1.0	0.0	8.3	0.0	29	5.8	1.067	1.2	1.0	7.3	0
98-77-6	30	9.2	12.6	3.0	0.0	15.6	0.0	18	8.0	1.083	1.0	1.3	5.0	0
98-77-7	30	6.2	7.7	4.4	0.0	12.1	0.0	24	5.8	1.076	1.8	2.2	7.0	0
98-80-11	40	10.6	7.4	1.0	0.0	8.4	0.0	28	9.9	1.069	1.0	1.2	5.7	3
98-107-12	24	11.9	11.1	1.8	0.0	12.9	0.0	23	6.9	1.073	1.0	1.5	7.0	0
98-107-13	24	5.8	12.3	9.4	0.0	21.7	0.0	13	5.5	1.076	2.5	1.7	4.3	0
98-109-1	30	7.4	11.9	7.1	0.0	18.9	0.0	16	6.1	1.071	2.2	1.2	5.7	0
98-110-6	36	7.6	9.9	2.1	0.0	12.1	0.0	25	6.5	1.067	1.5	1.2	6.3	13†
98-116-2	40	7.3	0.7	0.0	0.0	0.7	0.0	30	6.5	1.070	1.0	1.2	4.0	-
Significance+		***	***	skew	skew	***	skew		***	***	skew	skew	***	*
LSD P = 0.05		2.6	3.3			4.6			1.2	0.004			1.2	
LSD P = 0.01						6.1								

* Tuber characteristics: **bold** typeface = suitable, plain type = questionable, *italic* = unsuitable.
@ ACD (after-cooking-darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
~ Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy.
# Samples assessed visually after crisping: 1 - 10, 7 = borderline, >7 = too dark for domestic French-fries.
† Flesh faults; † indicates significantly greater faults compared with Delaware.
+ "skew" indicates data did not fulfil assumptions of analysis of variance.

Table 9.5.6.2. Yield and quality of fresh market entries in a February 2003 planted district trial at Jindong.

Planted: 4 February 2002				Harvested: 11 June 2003								Soil type: clay loam		
Row spacing: 75 cm				Soil temp. at harvest: 8°C								Elevation: 40 m		
Entry tuber* characteristics & spacing in rows (cm)		Yield (t/ha)						Rank by Grade No.1	Tuber no. per plant	Quality				
		Chats 0-70g	Small 70-120g	Med-ium 120-350g	Large 350-450g	Grade No. 1 70-450g	Over size >450g			SG	ACD @	Slou-gh ing~	Fry# color	Flesh faults (%)†
Selection criteria														
Suitable											<2.0	<2.0	<7.0	
Coliban	15	2.5	8.0	18.7	0.2	27.0	0.0	4	3.5	1.063	1.7	1.3	6.7	0
Delaware	24	6.0	8.6	6.8	0.0	15.5	0.0	17	5.4	1.061	1.7	1.0	7.7	0
Eben	24	2.5	8.9	12.5	0.0	21.4	0.0	11	4.8	1.078	2.3	1.8	5.7	0
Eureka	20	3.4	8.4	13.1	0.0	21.5	0.0	10	4.0	1.072	2.5	1.0	4.7	0
KT3	24	2.0	3.6	20.8	1.0	25.3	0.6	5	4.8	1.058	1.5	1.0	7.7	0
Mondial	15	4.9	9.3	20.3	0.0	29.6	0.8	2	4.3	1.056	1.3	1.2	7.3	0
Nadine	24	3.9	6.6	12.2	0.0	18.9	0.0	12	6.5	1.052	1.2	1.0	9.0	0
PO3	24	2.5	7.5	22.6	2.2	32.4	0.3	1	5.9	1.072	1.5	1.2	6.3	0
Ruby Lou	20	9.8	12.5	4.1	0.0	16.6	0.0	15	6.6	1.069	2.2	1.0	4.7	0
TK51.6	24	5.0	7.9	13.8	0.0	21.7	0.0	9	6.7	1.075	1.8	1.3	8.0	43†
98-4-5	24	3.9	6.8	19.4	0.7	27.0	0.0	3	5.4	1.056	1.8	1.3	7.0	0
98-20-28	24	5.8	8.3	3.0	0.0	11.3	0.0	23	4.7	1.080	1.8	1.0	4.7	0
98-31-22	20	1.9	5.3	17.4	0.0	22.7	0.0	7	3.6	1.065	2.7	1.0	6.3	0
98-32-4	24	5.0	8.8	14.8	0.0	23.6	0.0	6	5.7	1.066	2.8	1.2	5.7	0
98-33-27	24	5.1	7.7	10.1	0.0	17.8	0.0	13	5.1	1.076	1.7	2.2	5.3	3
98-33-28	36	5.0	7.0	4.0	0.4	11.5	0.0	22	7.9	1.080	2.8	1.0	4.7	3
98-33-30	30	5.0	5.5	4.5	0.0	10.0	0.0	26	5.6	1.078	3.2	2.0	5.0	7
98-33-58	30	6.8	4.8	0.4	0.0	5.2	0.0	30	6.1	1.083	3.5	1.2	4.3	0
98-34-11	24	7.8	10.3	6.7	0.0	16.9	0.0	14	6.7	1.069	1.8	1.2	5.7	0
98-40-5	30	3.7	5.7	7.9	0.0	13.5	0.0	18	6.0	1.070	3.0	1.0	5.3	0
98-54-28	36	4.9	7.9	4.1	0.0	12.0	0.0	21	7.8	1.066	1.8	1.0	7.3	0
98-54-33	30	10.0	5.4	1.4	0.0	6.8	0.0	29	7.6	1.068	1.7	1.8	5.3	0
98-57-9	30	2.7	3.6	5.4	0.0	9.0	0.0	28	3.3	1.069	2.8	1.2	5.7	0
98-77-6	30	2.3	5.9	7.0	0.0	12.9	0.0	20	4.7	1.083	1.3	2.3	5.0	0
98-77-7	30	2.1	3.1	6.1	0.0	9.2	0.0	27	6.9	1.080	3.3	1.7	6.0	10
98-80-11	40	6.5	7.7	3.0	0.0	10.7	0.0	25	8.2	1.069	1.5	1.0	4.7	0
98-107-12	24	6.7	10.0	5.6	0.0	15.7	0.0	16	9.6	1.071	1.0	1.3	6.7	0
98-107-13	24	4.4	9.0	4.4	0.0	13.4	0.0	19	4.5	1.077	2.0	2.2	5.0	0
98-109-1	30	2.3	4.9	17.1	0.0	22.0	0.0	8	4.2	1.077	3.5	1.3	5.0	0
98-110-6	36	4.0	7.3	3.9	0.0	11.2	0.0	24	4.9	1.070	2.7	1.2	5.3	3
Significance+		skew	***	***	skew	***	skew		***	***	***	skew	***	
LSD P = 0.05			2.8	4.6		5.2			1.5	0.003	0.7		0.8	

* Tuber characteristics: **bold** typeface = suitable, plain type = questionable, *italic* = unsuitable.
@ ACD (after-cooking-darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
~ Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy.
# Samples assessed visually after crisping: 1 - 10, 7 = borderline, >7 = too dark for domestic French-fries.
† Flesh faults; † indicates significantly greater faults compared with Delaware.
+ "skew" indicates data did not fulfil assumptions of analysis of variance.

9.5.7. Experiment 02AL37MA – November planted district trial at Pemberton.

Aim

The aim is to select varieties suited to summer production. A replacement for Delaware is needed: specifications are high yield, attractive tubers with versatile cooking quality.

Results

The trial grew well but emergence was low for Nadine (62%), 97-86-46 (67%) and 98-31-22 (66%). Yield and quality data are shown in Table 9.5.7. To be selected white skinned potatoes had to have suitable tuber characteristics, specific gravity greater than 1.064 (not significantly less than Delaware), yield greater than 29.4 t/ha (not highly significantly less than Nadine), after-cooking-darkening and slough less than or equal to 3, fry colour less than or equal to 6 (lighter than Delaware) with no major faults. Cadmium could not be significantly higher than Delaware. The sole white skinned selection (prior to cadmium results) was 98-31-22. For red-skinned entries to be selected an improvement over Ruby Lou was required. 98-34-11 was selected for its darker skin colour and reduced flesh faults, even though yield was significantly lower than Ruby Lou. For export, improvement over Mondial is needed (high yield and dark yellow flesh). No entries met these export criteria.

9.5.8. Experiment 02AL40 – Disease screening trial

Aim

To determine disease reaction of entries to powdery scab and crocodile skin.

Results

Powdery scab

Powdery scab results for one screening are shown in Table 9.5.8. Thirteen entries had a disease index not significantly higher than Desiree, the tolerant control. These were Atlantic, Dawmor, Eben, Nadine, Saxon, TK 51.6, 98-34-11, 98-54-33, 98-57-9, 98-77-6, 98-77-7, 98-109-1 and 98-116-2. These results need to be confirmed in a second screening.

Crocodile skin

Crocodile skin results for one screening are shown in Table 9.5.8. Eighteen entries appear to not have a significantly higher disease index than Nadine, the tolerant control. They were: Atlantic, Desiree, KT3, PO3, Royal Blue, Saxon, TK 51.6, 96-141-12, 98-10-11, 98-20-44, 98-27-3, 98-34-11, 98-40-5, 98-54-28, 98-57-9, 98-107-12, 98-107-13 and 98-109-1. These results need to be confirmed in a second screening.

Table 9.5.7. Yield and quality of fresh market entries in a November 2002 planted district trial at Pemberton.

Planted: 7 November 2002 | Harvested: 20 March 2003 | Soil type: Karri loam
Row spacing: 75 cm | Soil temp. at harvest: 17°C | Elevation: 200 m

Entry tuber* characteristics & spacing in rows (cm)		Yield (t/ha)						Rank by Grade No.1	Tuber no. per plant	Quality				
		Chats 0-70g	Small 70-120g	Med-ium 120-350g	Large 350-450g	Grade No. 1 70-450g	Over size >450g			SG	ACD @	Slou-gh ing~	Fry# color	Flesh faults (%)†
Selection criteria														
						≤29.4				>1.064	<3	≤3	≤6	
Coliban	15	2.7	8.1	48.3	2.7	59.1	0.3	2	4.8	1.068	3.0	2.0	4.7	0
Delaware	15	4.5	11.4	30.0	0.2	41.7	0.6	16	4.7	1.067	3.2	1.0	6.7	3
Eureka	20	4.6	10.3	46.7	2.8	59.8	0.3	1	8.7	1.071	3.8	1.3	4.0	7
KT3 (light yellow flesh)	24	6.4	10.1	33.5	2.1	45.7	1.2	12	8.9	1.061	3.2	1.0	6.3	0
Mondial (v l y flesh)	15	8.4	16.6	36.6	1.1	54.3	0.0	4	7.3	1.058	2.8	1.2	7.3	0
Nadine	20	4.2	5.6	29.8	5.0	40.3	2.2	18	9.3	1.052	1.0	1.0	10.0	0
Ruby Lou (red)	20	5.3	13.3	43.2	0.7	57.2	0.6	3	7.7	1.069	2.7	1.3	4.3	27†
TK51.6	24	15.3	5.3	0.6	0.0	5.9	0.0	26	11.7	1.085	2.5	1.3	8.7	0
97-86-46 (vl yflesh)	20	2.9	6.0	39.6	2.1	47.8	3.7	9	7.8	1.074	3.0	1.3	6.0	3
98-4-5	24	4.5	11.4	31.4	2.1	44.9	0.3	13	7.8	1.060	3.3	1.2	5.0	0
98-27-3	20	2.5	6.4	36.8	4.8	48.0	2.6	8	5.2	1.079	4.5	1.5	3.7	20†
98-31-22	15	1.2	3.0	31.5	9.4	43.9	5.6	14	4.5	1.069	3.0	1.3	6.0	0
98-32-4	24	1.7	5.3	36.4	5.7	47.4	2.5	10	6.0	1.066	3.0	1.0	6.0	17†
98-33-28	36	5.7	13.7	27.4	0.0	41.0	0.0	17	13.6	1.082	3.3	1.0	4.7	0
98-34-11 (red)	24	13.8	20.2	20.0	0.0	40.2	0.0	19	12.4	1.070	2.5	1.3	4.7	0
98-40-5	30	5.6	8.4	17.4	0.0	25.8	0.0	24	10.3	1.063	4.2	1.0	5.0	0
98-54-28	36	10.7	16.8	13.8	0.0	30.6	0.0	22	15.4	1.071	2.2	1.8	6.0	0
98-54-33	36	7.0	10.9	21.8	0.2	33.0	0.0	21	16.7	1.072	2.0	1.5	4.7	0
98-57-9	36	3.7	6.6	22.9	0.2	29.7	0.2	23	7.6	1.070	3.3	2.8	5.7	0
98-77-6	30	4.6	9.6	38.0	0.6	48.2	0.0	7	9.8	1.090	2.7	2.5	4.0	3
98-77-7	30	3.0	6.8	37.8	1.6	46.2	0.0	11	8.4	1.079	4.0	1.7	5.0	0
98-107-12	24	6.5	12.8	35.3	1.0	49.1	0.0	6	9.7	1.072	1.7	2.3	6.7	3
98-107-13	20	1.9	7.6	39.0	4.4	51.0	2.6	5	5.6	1.077	3.7	2.3	5.0	0
98-109-1	30	3.5	7.4	34.8	1.4	43.5	1.2	15	8.6	1.075	3.7	1.2	5.3	0
98-110-6	36	6.1	11.2	24.3	0.5	36.0	0.0	20	10.9	1.066	2.8	1.2	5.7	0
98-116-2	40	6.2	10.5	15.0	0.0	25.6	0.0	25	10.0	1.072	2.8	1.0	4.7	0
Significance+		***	***	***	skew	***	skew		***	***	***	skew	***	*
LSD P = 0.05		2.9	4.0	10.8		10.9			2.2	0.003	1.1		1.3	

* Tuber characteristics: **bold** typeface = suitable, plain type = questionable, *italic* = unsuitable.
@ ACD (after-cooking-darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
~ Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy.
# Samples assessed visually after crisping: 1 - 10, 7 = borderline, >7 = too dark for domestic French-fries.
† Flesh faults; † indicates significantly greater faults compared with Delaware.
+ "skew" indicates data did not fulfil assumptions of analysis of variance.

Table 9.5.8. Field tolerance to powdery scab & crocodile skin of potato entries in a trial at Baldivis 2002.

Entry	Disease			
	Powdery scab		Crocodile skin	
	Arcsin** severity score	Susceptibility rating~	Severity* score	Susceptibility rating~
Atlantic	1.86	tolerant	1.21	tolerant
Dawmor	0.91	tolerant	0.91	highly susc.
Desiree (pwd scab control)	1.87	tolerant control	0.44	tolerant
Eben	0.51	tolerant	0.79	highly susc.
KT3	2.64	highly susc.	0.22	tolerant
Nadine (croc skin control)	2.26	tolerant	0.08	tolerant control
PO3	3.46	highly susc.	0.08	tolerant
Royal Blue	2.19	highly susc.	0.00	tolerant
Saxon	0.00	tolerant	0.15	tolerant
TK 51.6	0.63	tolerant	0.09	tolerant
90-2-6 (Bliss)	2.12	susceptible	0.67	highly susc.
96-141-12	1.80	susceptible	0.21	tolerant
98-4-5	4.16	highly susc.	0.31	susceptible
98-10-11	3.68	highly susc.	0.02	tolerant
98-20-28	2.70	highly susc.	0.71	highly susc.
98-20-36	1.83	susceptible	0.95	highly susc.
98-20-37	3.21	highly susc.	0.89	highly susc.
98-20-38	2.30	highly susc.	1.28	highly susc.
98-20-39	2.65	highly susc.	0.90	highly susc.
98-20-44	2.47	highly susc.	0.03	tolerant
98-27-3	2.56	highly susc.	0.04	tolerant
98-31-22	2.19	highly susc.	0.68	highly susc.
98-32-4	2.20	highly susc.	1.07	highly susc.
98-33-27	3.09	highly susc.	0.95	highly susc.
98-33-28	1.82	susceptible	1.35	highly susc.
98-33-30	2.15	susceptible	1.18	highly susc.
98-33-58	2.61	highly susc.	0.95	highly susc.
98-34-11	0.77	tolerant	0.00	tolerant
98-40-5	1.81	susceptible	0.01	tolerant
98-54-28	3.53	highly susc.	0.02	tolerant
98-54-33	1.53	tolerant	0.98	highly susc.
98-57-9	1.66	tolerant	0.13	tolerant
98-77-6	1.62	tolerant	0.50	highly susc.
98-77-7	1.53	tolerant	1.05	highly susc.
98-80-11	2.16	susceptible	0.43	highly susc.
98-107-12	2.19	highly susc.	0.19	tolerant
98-107-13	3.82	highly susc.	0.10	tolerant
98-109-1	0.31	tolerant	0.07	tolerant
98-110-6	2.13	susceptible	0.93	highly susc.
98-116-2	1.51	tolerant	1.01	highly susc.
Significance+	***		***	
LSD P = 0.05	1.32		0.18	
LSD P = 0.01	1.74		0.23	

* Severity = number of tubers with 0-5% surface covered with disorder + (tubers with 5-25% disorder x 2) + (tubers with >25% disorder x 3) divided by total number of tubers.

** Arcsin severity score same as above but with data transformed to meet conditions for ANOVA.

~ Type: if the severity score is not sig. diff (5%) to the tolerant control the entry is classed as tolerant,
if the severity score is sig. greater (1%<P<5%) than the control the entry is classed as susceptible,
if the severity score is highly significantly (P<1%) greater than the tolerant control the entry is classed as highly

susceptible.

9.5.9. Selections for demonstrations.

To be tested in demonstrations entries had to be selected in one of the district trials and shown to have an advantage over the standard varieties. The selections from the May district trial would only be tested in the May demonstration. Selections from the other three trials would be tested in all three remaining demonstrations.

The nine entries selected for testing in demonstrations are shown in Table 9.5.9. These were PO3, 98-4-5, 98-31-22, 98-34-11, 98-77-6, 98-77-6, 98-77-7, 98-107-13 and 98-109-1.

The demonstrations will be planted in the next potato variety evaluation project for WA.

Table 9.5.9. Entries selected for testing in demonstrations of the fourteenth series of fresh market trials.

Entry	Trial where selected	Comments	Scab tolerance~ (from only one disease screening)	Re-test?
PO3	July February	Philippine processing variety	highly susceptible	yes
98-4-5	July		highly susceptible	yes
98-31-22	Nov		highly susceptible	yes
98-34-11	July		tolerant	yes
98-77-6	July		tolerant	yes
98-77-6	July		tolerant	yes
98-77-7	July		tolerant	yes
98-107-13	July		highly susceptible	yes
98-109-1	July		tolerant	yes

9.6 Fifteenth or "99" series of fresh domestic & export market experiments

9.6.1. Background

Breeding lines of the "99" series from the Department of Primary Industries, Victoria, Agriculture division's Potato Breeding Program were tested. Three screenings were completed and are described below. A May 2003 planted district trial was the last scheduled activity but was not planted due to the finding of potato virus y in some breeding lines.

9.6.2. Experiment 01BU1 – October 2001 planted unreplicated screening at Margaret River.

Aims

1. To select entries suitable for the fresh market in an October planting at Margaret River. The entries comprise 174 "99" series of Australian breeding lines, several earlier series

breeding line plus 18 imported varieties selected at the NPIC. These were compared with the standard varieties: Coliban, Delaware, Eureka, Mondial, Nadine and Ruby Lou.

2. To provide high quality seed for further tests.

Results

Selections from NPIC

280 breeding lines selected from the second year plots at the NPIC were sent to WA. 123 were categorised as fresh market types. 88 were selected for screening in WA for the fresh market and for export (yellow flesh). 39 were not selected for screening as they had unsuitable cooking quality; their SG was too low (<1.063) or fry colour was greater than >7 or after-cooking-darkening and slough were greater than 3. 1 was not selected for screening as it had unsuitable tuber characteristics.

Screening in WA

Upon harvest of the screening 63 entries were classified as fresh domestic market types (Table 9.6.2.1). Selections had suitable tuber characteristics with specific gravity greater than 1.065 with after-cooking-darkening less than 3 and sloughing less than 4 and fry colour lighter than 8. The 21 selections for further testing in next season's replicated screening are shown in bold typeface in Table 9.6.2.1.

Four entries were classified as fresh export market types (Table 9.6.2.2). These had suitable tuber characteristics with yellow flesh with specific gravity greater than 1.065.

Table 9.6.2.1 Tuber characteristics, yield and quality of fresh domestic market potato breeding lines in an October 2001 planted unreplicated screening at Margaret River. Selections in **bold** typeface.

Entry	Tuber* charact-eristics	SG	Yield >80g (t/ha)	Cook tests (NPIC 2000)			Final selection & notes
				Crisp# colour	Boil+ ACD	Boil+ Slough	
Selection criterion:	yes	>1.065					
BC0894-2	**yes**	**1.069**	**56**	**-**	**-**	**-**	**Yes**
Chieftain	yes	1.065	84	-	-	-	No, low SG
Cherry Red DT 6063-1R	**yes**	**1.071**	**49**	**-**	**-**	**-**	**Yes**
Coliban	?	1.063	73	-	-	-	Standard despite low SG
Delaware	no	1.072	91	-	-	-	Standard
Desiree	no	1.076	129	-	-	-	Standard
Durango Red (C086218-2)	yes	1.062	42	-	-	-	No, low SG
Eureka	?	1.074	97	-	-	-	Standard
Fontenot	?	1.075	41	-	-	-	No, TC
Ida Rose	yes	1.060	82	-	-	-	No, low SG
Mondial	?	1.063	107	-	-	-	Standard despite low SG
Nadine	yes	1.052	23	-	-	-	Standard, despite SG
Red Ruby	**yes**	**1.066**	**40**	**-**	**-**	**-**	**Yes**
Red Star	no	-	-	-	-	-	No, TC
Ruby Lou	?	1.068	89	-	-	-	Standard

*Tuber characteristics (tc); yes = suitable, ? = questionable, no = unsuitable

Crisp colour; scale 1 - 10 (light to dark), >7 unacceptable for French-fries.

+Boiling: ACD (after-cooking-darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy

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Table 9.6.2.1 continued. Tuber characteristics, yield and quality of fresh domestic market potato breeding lines in an October 2001 planted unreplicated screening at Margaret River. Selections in **bold** typeface.

Entry	Tuber* charact-eristics	SG	Yield >80g (t/ha)	Cook tests (NPIC 2000)			Final selection & notes
				Crisp# colour	Boil+		
					ACD	Slough	
Selection criterion:	yes	<1.065					
Vanquish	**yes**	**1.067**	**85**	**-**	**-**	**-**	**Yes**
Viking	yes	1.058	51	-	-	-	No, low SG
Winter Gem	yes	1.054	58	-	-	-	No, low SG
98-54-50 (rescreen)	yes	1.063	35	-	-	-	No, TC, low SG
99-2-15	no		-	-	-	-	No, TC
99-5-10	no	-	-	-	-	-	No, TC
99-6-4	?	1.060	50	5	2	2	No, TC, low SG
99-9-32	**yes**	**1.070**	**45**	**6**	**1**	**2**	**Yes**
99-11-5	**yes**	**1.079**	**64**	**7**	**1**	**3**	**Yes**
99-11-8	**yes**	**1.087**	**75**	**5**	**1**	**2**	**Yes**
99-17-2	yes	1.063	54	4	2	2	No, low SG
99-18-2	**yes**	**1.072**	**59**	**5**	**1**	**1**	**Yes**
99-19-3	yes	1.064	33	3	2	3	No, low SG
99-20-8	yes	1.064	73	6	1	3	No, low SG
99-20-14	yes	1.055	53	6	1	1	No, low SG
99-21-2	**yes**	**1.070**	**59**	**6**	**1**	**3**	*Yes*
99-21-7	yes	1.059	35	5	1	2	No, low SG
99-24-3	yes	1.074	32	4	3	1	No, ACD
99-27-20	**yes**	**1.067**	**78**	**6**	**1**	**3**	**Yes**
99-29-14	yes	1.063	57	4	1	1	No, low SG
99-29-15	yes	1.062	41	5	2	2	No, low SG
99-36-8	**yes**	**1.065**	**70**	**6**	**1**	**1**	**Yes**
99-44-20	?	1.072	61	2	2	1	No, TC
99-49-18	no	-	-	-	-	-	No, TC
99-51-2	**yes**	**1.079**	**73**	**5**	**1**	**1**	**Yes**
99-51-3	**yes**	**1.081**	**74**	**-**	**-**	**-**	**Yes**
99-52-1	yes	1.064	101	5	1	2	No, low SG
99-53-6	**yes**	**1.081**	**58**	**4**	**1**	**1**	**Yes**
99-56-4	no	-	-	-	-	-	No, TC
99-59-10	no	-	-	-	-	-	No, TC
99-59-13	no	-	-	-	-	-	No, TC
99-59-19	**yes**	**1.084**	**32**	**3**	**3**	**2**	**Yes**
99-61-3	no	-	-	-	-	-	No, TC
99-61-4	no	-	-	-	-	-	No, TC
99-61-7	yes	1.059	28	5	2	2	No, low SG
99-61-13	**yes**	**1.080**	**49**	**5**	**1**	**2**	**Yes**
99-61-31	no	-	-	-	-	-	No, TC
99-64-5	yes	1.058	16	4	3	2	No, low SG
99-66-9	no	-	-	-	-	-	No, TC
99-66-14	no	-	-	-	-	-	No, TC
99-67-7	no	-	-	-	-	-	No, TC
99-67-18	**yes**	**1.077**	**84**	**7**	**2**	**2**	**Yes**
99-71-2	**yes**	**1.082**	**81**	**6**	**2**	**1**	**Yes**
99-72-4	**yes**	**1.075**	**73**	**2**	**2**	**2**	**Yes**
99-78-52	**yes**	**1.082**	**76**	**2**	**2**	**2**	**Yes**
99-79-1	**yes**	**1.070**	**103**	**7**	**2**	**2**	**Yes**
99-79-3	no	-	-	-	-	-	No, TC
99-80-8	no	-	-	-	-	-	No, TC

*, #, +, see legend under previous table.

Table 9.6.2.2. Tuber characteristics, yield and quality of fresh export market potato breeding lines in an October 2001 planted unreplicated screening at Margaret River. Selections in **bold** typeface.

Entry	Tuber* charact-eristics	SG	Yield >80g (t/ha)	Cook tests (NPIC 2000)			Final selection & notes
				Crisp# colour	Boil+		
					ACD	Slough	
Selection criteria							
	yes	>1.065					
Nicola	?	1.065	26	-	-	-	No, low SG
Victoria	**yes**	**1.066**	**62**	**-**	**-**	**-**	**Yes**
99-23-3	**yes**	**1.083**	**94**	**6**	**1**	**1**	**Yes**
99-23-5	**yes**	**1.077**	**38**	**6**	**1**	**2**	**Yes**
99-23-11	**yes**	**1.074**	**45**	**5**	**1**	**1**	**Yes**
99-81-4	yes	1.064	75	3	1	2	No, low SG

*Tuber characteristics (tc); yes = suitable, ? = questionable, no = unsuitable
Crisp colour; scale 1 - 10 (light to dark), >7 unacceptable for French-fries.
+Boiling: ACD (after-cooking-darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy

Fifty-eight selections were not classified into either French-fry, fresh market or crisp. These are shown in Table 9.6.2.3.

These selections will be re-tested next season in a replicated screening. They will be tested with additional selections that will be made from the following May planted winter screening (see next section).

Table 9.6.2.3 Tuber characteristics of unclassified market potato breeding lines in an October 2001 planted unreplicated screening at Margaret River.

Entry	Tuber* charact-eristics	Entry	Tuber* charact-eristics	Entry	Tuber* charact-eristics	Entry	Tuber* charact-eristics
Claret	no	99-18-5	no	99-32-18	no	99-59-15	no
Driver	no	99-19-2	no	99-34-2	no	99-61-14	no
Mainestay	no	99-19-23	no	99-34-12	no	99-63-5	no
Portage	no	99-19-26	no	99-34-14	no	99-65-12	no
Red La Soda	no	99-19-32	no	99-42-14	no	99-66-15	no
98-29-6	no	99-19-42	no	99-44-15	no	99-67-10	no
99-1-7	no	98-31-3 (2 setts)	no	99-44-17	no	99-67-28	no
99-5-5	no	99-22-8	no	99-44-22	no	99-70-30	no
99-7-3	no	99-22-11	no	99-44-40	no	99-72-13	no
99-9-13	no	99-27-2	no	99-46-8	no	99-78-15	no
99-9-25	no	99-27-13	no	99-50-23	no	99-79-10	no
99-10-1	no	99-27-17	no	99-50-25	no	99-79-11	no
99-12-6	no	99-27-25	no	99-52-2	no	99-79-14	no
99-13-1	no	99-29-9	no	99-53-1	no		
99-13-4	no	99-30-7	no	99-56-7	no		

*Tuber characteristics (tc); yes = suitable, ? = questionable, no = unsuitable

9.6.3. Experiment 02AL35 - May 2002 planted unreplicated screening at Baldivis.

Aims

To select entries suitable for the fresh market in a May planting from the "99" series of breeding lines selected at the NPIC and other varieties described for Experiment 01BU2 (see previous section).

Domestic fresh market selections

39 entries were classified as fresh market types (Table 9.6.3). To be selected entries had to have suitable tuber characteristics, specific gravity greater than 1.057 with crisp colour (fry score) lighter than 7 and after-cooking-darkening and slough scores less than 3. The ten selections were Cherry Red, Red Star, 97-101-7, 99-5-10, 99-9-7, 99-9-25, 99-23-11, 99-37-16, 99-58-25 and 99-64-5. These are shown in bold in Table 9.3.6.1.

Export fresh market selections

No entries were classified as export fresh market types.

Selections for replicated screening.

Selections for further testing from both unreplicated screenings are shown in Table 9.6.4.

9.6.4. Experiment 02AL36 – October 2002 planted replicated screening at Margaret River.

Background

This screening selected fresh market material from a mixed planting of breeding lines for the fresh, crisp, French-fry and export markets.

Aims

1. To bulk seed of the lines selected in the previous screenings.
2. To apply further selection pressure to reduce the number to be tested in district trials. The additional selection pressure can only be applied to summer selections. Entries, which have been selected for their winter performance, will be tested in district trials without regard for their performance in this summer screening.

Results

Yield and quality data are shown in Table 9.6.4. Some entries shown in Table 9.6.4 do not appear in the previous fresh screenings as they were selected from other streams. 99-9-1 was previously tested as a French-fry (see Table 7.5.2) while 99-5-14, 99-9-1, 99-50-27, 99-62-3 and 99-79-17 were tested as crisps (see Table 5.2.1). Of the 67 entries, 39 were categorised as fresh market types. Selections had suitable tuber characteristics, yield greater than 40.5 t/ha (not significantly less than Delaware), specific gravity not significantly less than Delaware (i.e. 1.061 or greater) with fry colour less than 8, after-cooking-darkening and slough less than 3 with internal disorders not significantly greater than Delaware. Coloured varieties had to pass a skinning test. Selections were Cherry Red, Victoria, 99-23-11 and 99-61-13.

Table 9.6.3 Quality and yield of domestic & export fresh market potato breeding lines in a May 2002 planted unreplicated screening at Baldivis. Selections shown in bold.

Entry	Tuber* charact-eristics	SG	Yield >80g (t/ha)	Cooking tests			Flesh faults (%)	Final selection & notes
				Crisp# colour	Boil+			
					ACD	Slough		
Selection criterion	yes	>1.057	>30	<7	<3	<3	<30	
Cherry Red (DT 6063-1R)	**yes**	**1.062**	**43**	**8**	**1**	**2**	**0**	*Yes*
Coliban	?	1.069	32	7	2	2	30	No, TC, dk fry, internals
Delaware (ex Darnell)	?	1.060	58	6	1	2	0	No, TC
Desiree	no	1.063	50	7	1	2	0	No, TC
Durango Red (C086218-2)	yes	1.069	46	7	2	2	0	No, dk fry?
Eureka	?	1.069	42	7	2	2	0	No, TC
Mondial (ex ex seed)	yes	1.056	97	8	1	1	0	No, low SG, dk fry
Nadine	yes	1.050	48	10	1	1	0	No, low SG, dk fry
Nicola	yes	1.059	37	8	1	1	0	No, dk fry
Red Ruby	yes	1.055	44	8	1	1	0	No, low SG, dk fry
Red Star	**yes**	**1.064**	**45**	**5**	**1**	**1**	**0**	**Yes**
Ruby Lou	yes	1.066	40	7	1	1	0	No, dk fry
Shepody	yes	1.070	37	8	1	2	0	No, dk fry
Vanquish	yes	1.050	51	9	1	1	0	No, lo SG, lo yield, dk fry
Victoria	yes	1.056	23	7	1	1	0	No, low SG, dk fry
97-101-7	**yes**	**1.068**	**48**	**4**	**1**	**2**	**0**	**Yes**
98-29-6 (rescreen)	yes	1.049	67	7	2	1	0	No, low SG, dk fry
99-5-10	yes	1.066	14	5	1	1	0	No, v low yield
99-6-4	yes	1.052	45	8	2	2	0	No, dk fry
99-9-7	**yes**	**1.066**	**49**	**2**	**1**	**1**	**0**	**Yes**
99-9-25	yes	1.063	30	6	2	2	0	No, v low yield
99-19-32	yes	1.067	33	7	1	1	0	No, dk fry
99-20-8	?	1.063	42	4	1	2	0	No, TC
99-22-8	yes	1.064	29	7	2	1	0	No, v low yield, dk fry
99-23-11	**yes**	**1.074**	**28**	**4**	**1**	**2**	**0**	**Yes**
99-29-14	yes	1.068	56	7	2	2	70	No, dk fry, internals
99-32-18	yes	1.061	40	8	2	1	0	No, dk fry
99-37-16	**yes**	**1.064**	**37**	**4**	**2**	**2**	**0**	**Yes**
99-52-1	yes	1.055	18	6	1	1	0	No, lo SG,v lo yield
99-52-4	yes	1.082	20	7	1	2	0	No, v low yield, dk fry
99-58-25	**yes**	**1.062**	**41**	**3**	**2**	**2**	**20**	**Yes**
99-64-5	**yes**	**1.070**	**34**	**6**	**2**	**1**	**0**	**Yes**
99-64-10	yes	1.070	55	3	3	3	0	No, ACD, slough
99-66-9	yes	1.065	25	3	2	3	0	No, v low yield, slough
99-67-28	yes	1.074	43	3	1	3	0	No, slough
99-70-30	?	1.073	28	5	1	3	0	No, TC, v lo yield, slough
99-79-1	yes	1.059	19	8	1	2	0	No, v low yield, dk fry
99-79-10	yes	1.063	24	5	2	1	30	No, v low yield, internals
99-79-13	yes	1.057	7	5	1	1	0	No, low SG, v low yield

*Tuber characteristics; Yes = suitable, ? = questionable, no = unsuitable
#Crisp colour: 1-10, >7 too dark
+Boiling: ACD (after-cooking-darkening): 1 = nil, 3 = moderate, 5=general blackening
Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy

Winter selections

Winter performance must be considered when selecting material for district trials. Addition selections from the winter screening (see previous section) which will also be tested in district trials are; Cherry Red (also selected in summer), Red Star, 97-101-7, 99-5-10, 99-9-7, 99-9-25, 99-23-11, 99-37-16, 99-58-25 and 99-64-5.

Selections for district trials

Selections will be planted in district trials in the next project after clean seed is produced.

Table 9.6.4. Yield and quality of domestic fresh market (white fleshed) entries in an October 2002 planted replicated screening at Margaret River.

Planted: 25 October 2002 Harvested: 4 March 2003 Soil type: sandy loam
Row spacing: 75 cm Soil temp. at harvest: 16°C Elevation: 100 m

Entry, tuber* characteristics and spacing (cm)		Yield (t/ha)						Rank by Grade No.1	Tuber no. per plant	Quality			
		Chats 0-70g	Small 70-120g	Med-ium 120-350g	Large 350-450g	Grade No. 1 70-450g	Over size >450g			SG	ACD @	Slough ~	Fry# colour
Selection criterion													
						≤40.5				≤1.061	≤3	<3	<8
BC0894-2	24	10.3	27.4	13.5	0.0	40.9	0.0	26	11.8	1.063	3.5	1.5	5.5
Cherry Red	24	6.4	25.2	26.1	0.0	51.3	0.0	13	10.5	1.071	3.0	1.8	5.5
Coliban	15	6.4	20.4	40.1	0.8	61.2	0.0	6	8.9	1.066	3.3	1.0	6.5
Delaware	20	14.3	32.6	23.4	0.0	56.0	0.0	10	12.5	1.066	2.8	1.0	7.5
Desiree	20	6.3	23.2	48.0	1.3	72.5	0.0	1	10.6	1.074	2.3	1.5	6.5
Durango Red	24	6.4	13.9	24.2	0.0	38.1	0.0	30	9.4	1.066	3.0	1.3	6.5
Eureka	20	2.4	5.9	21.1	0.0	27.0	0.0	37	9.3	1.076	3.3	1.3	5.0
Mondial	15	11.1	25.0	40.3	0.0	65.3	0.0	3	9.6	1.060	2.3	1.3	8.0
Nadine	24	7.6	19.0	22.0	0.0	41.0	0.0	25	11.4	1.047	1.0	1.0	10.0
Nicola	24	20.0	31.8	14.3	0.0	46.1	0.0	18	16.5	1.065	2.3	1.0	8.0
Red Ruby	24	3.6	16.8	25.4	0.0	42.2	0.0	22	8.3	1.061	2.5	1.0	9.0
Red Star	24	12.2	29.4	12.4	0.0	41.8	0.0	24	12.4	1.075	1.8	1.3	5.5
Ruby Lou	20	8.1	25.9	34.6	0.0	60.4	0.0	7	10.7	1.066	2.8	1.0	3.0
Russet Burbank	40	8.6	19.0	21.0	0.0	40.0	0.0	27	16.8	1.081	1.5	1.3	6.0
Vanquish	24	3.2	17.2	50.8	1.4	69.5	0.0	2	12.3	1.064	2.0	1.3	9.5
Victoria	24	4.5	27.4	35.8	0.0	63.2	0.0	5	11.8	1.064	2.3	1.0	6.0
97-101-7	24	7.4	26.1	25.1	0.0	51.2	0.0	14	11.6	1.075	3.5	1.0	3.5
Significance+		***	***	***	skew	***	ns		***	***	***	***	***
LSD P = 0.05		4.7	6.2	11.7		11.5			2.5	0.005	0.8	0.7	2.1
LSD P = 0.01						15.4							

* Tuber characteristics: **bold** typeface = suitable, plain type = questionable, *italic* = unsuitable.
@ ACD (after-cooking-darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
~ Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy.
# Samples assessed visually: 1 - 10, 6 = borderline, >6 = too dark.
+ "skew" indicates data did not fulfil assumptions of analysis of variance.

Table 9.6.4. continued**.** Yield and quality of domestic fresh market (white fleshed) entries in an October 2002 planted replicated screening at Margaret River.

Planted: 25 October 2001 Harvested: 4 March 2002 Soil type: sandy loam
Row spacing: 75 cm Soil temp. at harvest: 16°C Elevation: 100 m

Entry, tuber* characteristics and spacing (cm)		Yield (t/ha)						Rank by Grade No.1	Tuber no. per plant	Quality			
		Chats 0-70g	Small 70-120g	Med-ium 120-350g	Large 350-450g	Grade No. 1 70-450g	Over size >450g			SG	ACD @	Slough ~	Fry# colour
Selection criterion													
						≤40.5				≤1.061	≤3	<3	<8
99-5-14	24	15.9	28.4	8.2	0.0	36.6	0.0	32	11.8	1.071	3.0	1.0	4.5
99-9-1	30	4.2	16.5	23.1	0.0	39.6	0.0	28	10.0	1.075	4.3	1.3	6.5
99-9-7	20	9.4	16.8	48.1	0.0	64.9	0.0	4	10.5	1.089	4.0	1.5	4.0
99-9-25	24	13.0	30.9	16.1	0.0	47.0	0.0	17	13.2	1.073	4.5	1.3	5.0
99-9-32	24	4.8	23.3	31.2	0.0	54.5	0.0	11	10.5	1.081	4.3	2.3	5.0
99-11-5	24	14.2	20.2	15.9	0.0	36.2	0.0	33	11.6	1.079	2.3	2.0	4.5
99-18-6	24	17.0	32.7	6.7	0.0	39.4	0.0	29	14.4	1.078	3.3	1.3	5.5
99-21-2	24	8.7	27.6	16.1	0.0	43.6	0.0	20	11.6	1.073	3.5	2.5	5.0
99-23-11	24	11.6	26.3	19.7	0.0	46.0	0.0	19	11.1	1.079	2.8	1.5	5.5
99-24-3	30	22.0	25.9	7.0	0.0	32.9	0.0	34	18.7	1.077	3.5	1.3	6.0
99-36-8	24	7.2	20.5	27.8	0.7	49.0	0.0	15	12.1	1.056	2.8	1.5	7.5
99-50-27	24	13.5	25.8	12.1	0.0	37.9	0.0	31	12.7	1.084	4.0	1.3	4.5
99-51-3	24	32.7	34.4	7.6	0.0	42.0	0.0	23	19.9	1.072	3.5	1.0	5.5
99-53-6	24	20.8	21.5	5.6	0.0	27.1	0.0	36	14.7	1.075	4.0	1.0	4.0
99-59-19	30	10.6	17.8	6.9	0.0	24.8	0.0	38	11.4	1.085	3.5	1.8	4.0
99-61-13	24	8.7	20.2	21.8	0.3	42.3	0.0	21	11.1	1.083	2.8	2.5	4.0
99-62-3	30	7.3	13.1	10.0	0.0	23.1	0.0	39	9.7	1.084	3.5	3.5	4.0
99-67-18	20	5.3	20.9	39.5	0.0	60.4	0.0	8	9.0	1.078	3.3	1.5	3.5
99-67-28	24	7.4	23.5	30.1	0.0	53.6	0.0	12	11.7	1.089	3.3	1.5	5.0
99-71-2	24	9.4	15.1	16.9	0.0	32.1	0.0	35	9.9	1.079	4.0	1.0	3.5
99-79-1	24	9.3	34.9	24.4	0.0	59.2	0.0	9	13.1	1.073	2.8	2.0	7.5
99-79-17	24	18.0	30.5	17.6	0.0	48.1	0.0	16	14.6	1.088	3.0	3.5	3.5
Significance+		***	***	***	skew	***	ns		***	***	***	***	***
LSD P = 0.05		4.7	6.2	11.7		11.5			2.5	0.005	0.8	0.7	2.1
LSD P = 0.01						15.4							

* Tuber characteristics: **bold** typeface = suitable, plain type = questionable, *italic* = unsuitable.
@ ACD (after-cooking-darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
~ Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy.
# Samples assessed visually: 1 - 10, 6 = borderline, >6 = too dark.
+ "skew" indicates data did not fulfil assumptions of analysis of variance.

9.7 Sixteenth or "00" series of fresh domestic & export market experiments

9.7.1. Background

Breeding lines of the "00" series from Agriculture Victoria's Potato Breeding Program were tested. One unreplicated screening was completed. The subsequent winter unreplicated screening was not planted due to the finding of PVY in two breeding lines (see Section 9.1).

9.7.2. Experiment 02AL34 – November 2002 planted unreplicated screening at Margaret River.

Aims

1. To select entries suitable for the fresh market in an October planting at Margaret River. The entries comprise 168 "00" series of Australian breeding lines plus three other earlier series breeding lines selected at the NPIC plus one further "98" series breeding line. The Dutch variety Bintje was also tested. These were compared with the standard fresh market varieties: Coliban, Delaware, Desiree, Eureka, Mondial, Nadine and Ruby Lou.
2. To provide high quality seed for further tests.

Results

Selections from NPIC

259 selections were sent to WA. 95 were rejected on cooking quality or other selection criteria.

86 were categorised as crisps. 68 were selected for screening in WA. 18 were rejected due to unsuitable cooking quality (low SG (< 1.075) or dark fry colour).

Nine were categorised as French-fries. Four were selected for screening in WA.

174 were categorised as fresh market types. 101 were selected for screening in WA. 73 were not selected for screening as they had unsuitable cooking quality; their SG was too low or fry colour was too dark or after-cooking-darkening and slough were unacceptable.

Screening in WA

Eighty-four entries were classified as fresh domestic market types (Table 9.7.2.1). Selections had suitable tuber characteristics with specific gravity greater than 1.065 with after-cooking-darkening and sloughing both less than 2 and fry colour lighter than 7. The eight selections for further testing in next season's replicated screening are shown in bold typeface in Table 9.7.2.1.

No entries were classified as fresh export market types as no yellow fleshed entries had suitable tuber characteristics.

Forty-nine selections were not classified as French-fry, fresh market or crisp. These unclassified entries are shown in Table 9.7.2.2. None of these entries will be tested further unless selected in the winter screening (see next section).

Table 9.7.2.1 Tuber characteristics, yield and quality of fresh domestic market potato breeding lines in a November 2002 planted unreplicated screening at Margaret River. Selections in **bold** typeface.

Entry	Tuber* charact-eristics	SG	Yield >80g (t/ha)	Cook tests (NPIC 2002)			Final selection & notes
				Crisp#	Boil+		
				colour	ACD	Slough	
Selection criteria	yes	>1.065		<7	<2	<2	
Bintje	no	-	-	-	-	-	no
Coliban	**yes**	**1.075**	**44**	**-**	**-**	**-**	**yes**
Delaware	no	1.071	53	-	-	-	standard
Desiree	no	1.066	48	-	-	-	no
Eureka	?	1.075	47	-	-	-	no
Mondial	yes	1.062	53	-	-	-	no
Nadine	yes	1.050	36	-	-	-	no
Ruby Lou	**yes**	**1.068**	**32**	**-**	**-**	**-**	**yes, standard**
Shepody	no	1.066	25	-	-	-	no, standard
99-13-1 (rescreen)	**yes**	**1.072**	**18**	**-**	**-**	**-**	**yes**
99-64-5 (rescreen)	yes	1.061	18	-	-	-	no
00-1-2	yes	1.083	21	7	1	3	no
00-1-3	yes	1.075	22	4	1	3	no
00-1-5	**yes**	**1.071**	**38**	**5**	**1**	**1**	**yes**
00-1-6	rescreen	1.063	7	4	1	1	no
00-2-3	yes	1.078	18	2	1	3	no
00-2-4	yes	1.073	33	6	1	2	no
00-3-1	yes	1.069	24	5	1	2	no
00-3-4	?	1.071	13	6	2	2	no
00-3-10	yes	1.069	30	5	2	2	no
00-4-7	?	1.082	33	6	1	3	no
00-4-8	no	-	-	-	-	-	no
00-5-11	yes	1.067	30	6	1	2	no
00-5-12	no	-	-	-	-	-	no
00-6-24	**yes**	**1.072**	**39**	**4**	**1**	**1**	**yes**
00-6-25	no	-	-	-	-	-	no
00-6-31	yes	1.077	36	7	1	2	no
00-7-2	yes	1.079	16	3	2	1	no
00-8-6	no	-	-	-	-	-	no
00-8-8	no	-	-	-	-	-	no
00-11-2	rescreen	1.072	8	2	2	3	no
00-11-6	?	1.084	28	6	1	1	no
00-11-9	yes	1.081	31	5	1	3	no
00-11-14	no	-	-	-	-	-	no
00-11-21	yes	1.084	36	5	2	2	no
00-11-27	yes	1.078	41	5	3	2	no
00-11-28	**yes**	**1.076**	**24**	**-**	**-**	**-**	**yes**
00-12-1	no	-	-	-	-	-	no
00-12-3	no	-	-	-	-	-	no
00-13-6	no	-	-	-	-	-	no
00-13-10	no	-	-	-	-	-	no
00-15-5	no	-	-	-	-	-	no
00-15-25	yes	1.082	25	5	1	2	no

*Tuber characteristics (tc); yes = suitable, ? = questionable, no = unsuitable

Crisp colour; scale 1 - 10 (light to dark), >7 unacceptable for French-fries.

+Boiling: ACD (after-cooking-darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy

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Table 9.7.2.1 continued. Tuber characteristics, yield and quality of fresh domestic market potato breeding lines in a November 2002 planted unreplicated screening at Margaret River. Selections in **bold** typeface.

Entry	Tuber* charact-eristics	SG	Yield >80g (t/ha)	Cook tests (NPIC 2002)			Final selection & notes
				Crisp# colour	Boil+		
					ACD	Slough	
00-15-80	yes	1.082	27	5	2	3	no
00-17-3	yes	1.077	18	3	1	2	no
00-19-4	yes	1.055	49	7	1	1	no
00-19-12	yes	1.063	41	4	1	1	no
00-19-22	yes	1.062	25	7	2	1	no
00-19-43	no	-	-	-	-	-	no
00-19-44	yes	1.058	29	5	1	1	no
00-19-46	no	-	-	-	-	-	no
00-20-6	no	-	-	-	-	-	no
00-20-17 (ayers)	yes	1.074	54	7	2	2	no
00-20-18	yes	1.072	26	4	1	2	no
00-20-34	yes	1.074	31	6	1	2	no
00-20-50	yes	1.057	34	7	1	1	no
00-21-3	no	-	-	-	-	-	no
00-21-13	yes	1.063	40	7	2	2	no
00-21-14	yes	1.058	29	*	*	*	no
00-22-2 (ayers)	yes	1.082	12	3	2	1	no
00-26-1	yes	1.083	39	6	2	2	no
00-33-4	rescreen	1.066	12	7	2	1	no
00-38-3	no	-	-	-	-	-	no
00-48-1	**yes**	**1.071**	**59**	**6**	**1**	**1**	**yes**
00-49-1	yes	1.063	38	-	-	-	no
00-51-8	yes	1.055	27	5	1	1	no
00-51-9	yes	1.064	27	7	2	2	no
00-51-22	no	-	-	-	-	-	no
00-54-2	no	-	-	-	-	-	no
00-55-1	no	-	-	-	-	-	no
00-55-5	no	-	-	-	-	-	no
00-57-2	no	-	-	-	-	-	no
00-58-1	**yes**	**1.080**	**25**	**5**	**1**	**1**	**yes**
00-63-2	yes	1.061	46	7	2	2	no
00-66-2	no	-	-	-	-	-	no
00-68-2	no	-	-	-	-	-	no
00-69-5	yes	1.050	49	7	1	1	no
00-69-8	**yes**	**1.066**	**21**	*	*	*	**yes**
00-74-7	yes	1.062	30	4	2	1	no
00-75-1	no	-	-	-	-	-	no
00-82-6	yes	1.061	36	3	1	2	no
00-84-1	no	-	-	-	-	-	no
00-85-4	no	-	-	-	-	-	no
98-31-3 (rescreen)	**yes**	**1.065**	**25**	**-**	**-**	**-**	**yes**

*Tuber characteristics (tc); yes = suitable, ? = questionable, no = unsuitable

Crisp colour; scale 1 - 10 (light to dark), >7 unacceptable for French-fries.

+Boiling: ACD (after-cooking-darkening): 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5=general blackening
Sloughing: 1 = nil, 2 = slight, 3 = moderate, 4 = severe, 5 = soupy

Table 9.5.2.2 Tuber characteristics of unclassified market potato breeding lines in a November 2002 planted unreplicated screening at Margaret River.

Entry	Tuber* charact-eristics	Final selection & notes	Entry	Tuber* charact-eristics	Final selection & notes
00-1-8	no	-	00-26-3	no	-
00-3-2	no	-	00-29-8	no	-
00-3-12	no	-	00-33-19	no	-
00-6-1	no	-	00-39-9	no	-
00-8-9	no	-	00-39-18	no	-
00-11-10	no	-	00-39-25	no	-
00-11-24	no	-	00-45-1	no	-
00-13-13	no	-	00-46-1	no	-
00-15-35	no	-	00-46-2	no	-
00-15-41	no	-	00-46-4	no	-
00-15-54	no	-	00-46-11	no	-
00-15-70	no	-	00-47-3	no	-
00-16-7	no	-	00-51-3	no	-
00-16-19	no	-	00-51-12	no	-
00-16-21	no	-	00-53-1	no	-
00-16-22	no	-	00-53-3	no	-
00-19-1	no	-	00-68-6	no	-
00-19-9	no	-	00-69-4		rescreen
00-20-14	no	-	00-70-1	no	-
00-20-36	no	-	00-71-1	no	-
00-24-7	no	-	00-74-5	no	-
00-24-9	no	-	00-76-4	no	-
00-25-2	no	-	00-85-1	no	-
00-25-7	no	-	00-85-13	no	-
00-25-10	no	-			

*Tuber characteristics (tc); yes = suitable, ? = questionable, no = unsuitable

10. Fresh market Discussion

10.1 Introduction

The eleventh series of experiments identified nine fresh market breeding lines for further testing (Table 9.2.6). Four of these, 92-123-7 (Passion), 89-12-1 (Eureka), 90-105-16 (Winter Gem) and 91-153-1 (Dynamite), were already undergoing commercial testing after selection in previous series (Dawson & Mortimore 2000). Some were de-selected as the experimental program progressed. These were 94-59-2 (Baton), 95-12-2 (Willare), 95-39-8 (Sentosa) and 95-83-11 (Sandfire). Some others were de-selected as their commercial testing progressed. 92-123-7 (Passion), 90-105-16 (Winter Gem) and 91-153-1 (Dynamite) encountered production problems and were rejected by industry. 92-123-7 (Passion) consistently produced low yields. 90-105-16 (Winter Gem) was prone to damage of its soft skin under cool and wet harvest conditions. 91-153-1 (Dynamite) proved to be an inconsistent performer. The remaining breeding line, 95-11-20 (Auski) was a new selection that showed promise in providing improvements over existing standard varieties. A summary showing the benefits this selection offers industry is shown in Table 10.1. Further discussion of 95-11-20 (Auski) is given in Section 10.3.

The twelfth series of experiments resulted in the identification of five fresh market breeding lines that were recommended for further testing (Table 9.3.10). Of these 89-12-1 (Eureka) was already undergoing commercial testing after selection in previous series (Dawson & Mortimore 2000). Another selection, Carlingford, was undergoing commercial tests by Western Potatoes. One new selection, 95-83-11 (Sandfire) was de-selected as the experimental program progressed. This was because it was selected in the May planted demonstration only because it was also selected for other planting times. However 95-83-11 (Sandfire) was de-selected from these other planting times as its yield was considered to be too low (Section 9.3.7). The remaining breeding lines were 95-11-20 (Auski) and 96-141-12 (Windsor). A summary showing the benefits these selections offer industry is shown in Table 10.1. Further discussion of 96-141-12 (Windsor) is given in Section 10.5.

The thirteenth series of experiments identified four fresh market varieties and breeding lines for further testing (Table 9.4.13). Of these 95-11-20 (Auski) was selected in the two previous series. The three new selections were Maris Piper, 95-37-12 (Billabong) and 97-38-2 (White Star). A summary showing the benefits these selections offer industry is shown in Table 10.1. Further discussion of Maris Piper, 95-37-12 (Billabong) and 97-38-2 (White Star) can be found in Sections 10.2, 10.5 and 10.6 respectively.

Table 10.1. New fresh market varieties and breeding lines selected for further testing in Project PT00010.

Variety	Benefits over Delaware & Nadine	Where benefits will be delivered
Maris Piper	• Improved appearance and pack-out	} metro
	• Improved resistance to powdery scab	} metro
	• Resistant to PCN cf. Delaware	} metro
	• Improved resistance to crocodile skin cf. Delaware.	} metro
95-11-20 (Auski)	• 20%higher marketable yield than Delaware	} Manji-Pemberton
	• Better appearance than Delaware	} Manji-Pemberton/double crop
	• Better skin bloom than Delaware	} Manji-Pemberton/double crop
	• Lighter fry colour & large tubers give better fresh chips	} Manji-Pemberton/double crop
	• Lower planting density than Delaware	} Manji-Pemberton/double crop
	• Improved resistance to crocodile skin cf. Delaware.	double crop
	• Saved seed will perform well for the following autumn grown crop unlike saved seed of Nadine	double crop
95-37-12 (Billabong)	• Better appearance than Delaware,	} Manji-Pemberton/double crop
	• Higher specific gravity,	} Manji-Pemberton/double crop
	• Better taste than Nadine,	} Manji-Pemberton/double crop
	• Better post harvest skin bloom	} Manji-Pemberton
	• Better fry quality than Delaware and Nadine	} Manji-Pemberton
96-141-12 (Windsor)	• Potential early French-fry variety with suitable appearance for the fresh market	} metro/double crop
	• Larger tubers than 89-12-1 (Eureka),	} metro/double crop
97-38-2 (White Star)	• Better appearance than Delaware	} metro/double crop
	• More versatile cooking quality than Nadine	} metro/double crop
	• Better yield than Nadine	} metro
	• Larger tubers than Delaware and Nadine,	} metro
	• Better fry quality than Delaware and Nadine	} metro
	• More tolerant to crocodile skin than Delaware	} metro

10.2 Maris Piper

Breeding and appearance

Maris Piper was bred at the Plant Breeding Institute in the UK. Its parents were Andigena x Ulster Knight x Arran Cairn. It was granted Plant Breeders Rights in the UK in 1967. Maris Piper is used as a parent in the National Potato Improvement and Evaluation Scheme. Maris Piper tubers are oblong and medium size when planted in May at 30 cm. Eyes and heel are shallow and skin is smooth. Skin and flesh colour is cream.

Performance

Maris Piper was tested in the thirteenth series of experiments where it performed best in May plantings. These results are summarised below and in Table 10.2.

In the May planted unreplicated screening Maris Piper had suitable tuber characteristics compared with the questionable tuber characteristics of Delaware and Nadine. Maris Piper had higher specific gravity than Delaware and Nadine. Crisp colour of Maris Piper was lighter than Delaware while after-cooking-darkening and slough scores were equal to or better than Delaware (Table 10.2, Trial 00PE1).

In the following year's May planted district trial Maris Piper had improved tuber characteristics compared with Delaware and Nadine (Table 10.2, Trial 01PE8). Maris Piper had significantly higher specific gravity than Delaware, and of-course Nadine, and had equal boiling scores compared with Delaware. Maris Piper had darker fry colour than Delaware. Yield of Maris Piper was similar to Delaware. Maris Piper produced tubers with an average weight of 133 grams which were smaller than Delaware's (164 g) but larger than Nadine (127 g).

In the third year of testing Maris Piper also performed well having suitable tuber characteristics May planted demonstration. Maris Piper's yield of 39 t/ha was considerably less than Delaware's 56.3 t/ha and 97-38-2's (White Star's) 47.3 t/ha. However small scale commercial tests of Maris Piper and 97-38-2 (White Star), which were grown adjacent to the demonstration, showed that yields of Maris Piper were similar to 97-38-2 (White Star) and Delaware at around 36 t/ha.

It is an advantage for varieties to have tolerance to powdery scab for May plantings. Maris Piper was shown to be tolerant of powdery scab. In one experiment it had significantly greater tolerance than the tolerant control variety Desiree (Table 10.2, Trial 01PE10).

Maris Piper was also shown to be tolerant of crocodile skin in both disease screening experiments (Table 10.2, Trials 01PE10 & 02AL32).

Commercial trials

Maris Piper was grown in small scale commercial trials in 2002 where half a tonne of seed was planted at two sites. Western Potatoes followed the potatoes through to the retail chain and surveyed customers. Their findings were that Maris Piper scored fairly high for both appearance and taste (Dawson *et al.* 2003). Packouts were assessed and Maris Piper produced a packout of 80% Premium & Class 1 with just 10% Class 2 (Dawson *et al.* 2003).

This was a substantially better pack-out than Nadine which had 52% Premium and Class 1 with 21% Class 2. The two wash packers involved were happy with Maris Piper's washing performance.

Benefits compared with Delaware and Nadine.

- Improved appearance and pack out
- Increased powdery scab tolerance,
- high resistance to PCN (*Globodera rostochiensis* race 1 & 5) (European Cultivated Potato Database 2001).
- Improved tolerance to "crocodile skin" cf. Delaware.

Disadvantages compared with Delaware and Nadine.

- Maris Piper produces smaller tubers than Delaware. However tuber size of Maris Piper will probably increase if planting density is decreased.

Table 10.2 Summary of May plantings of the 13th series of experiments of Maris Piper.

Entry & tuber* characteristics	Spac-ing in rows (cm)	Yield (t/ha)					Tuber		Quality					
		Small 70-120g	Medi-um 120-350g	Large 350-450g	Grade No. 1 70-450g	Over-size >450g	no. per plant	av mkt wt (g)	SG	Fry# color (Crisp)	ACD	Sloug-hing	Flesh faults (%)†	Bloom after 14 d
Averages across May planted experiments (winter screening excepted)														
May plantings, n = 2														(n=1)
Delaware		12.2	42.0	1.3	55.5	0.3	8.5	151	1.068	5.2	1.1	1.9	1.5	0
Maris Piper		12.1	35.6	0.6	48.3	0.2	9.3	134	1.072	5.9	1.1	1.4	0.0	20
Nadine		14.4	25.4	0.8	40.5	0.4	9.2	124	1.054	8.5	1.0	1.1	0.0	0
Individual experiments of the 13th or "97" series														
Trial 00PE1.	May planted unreplicated winter screening at Baldivis 2000. M. Piper selected.													
Delaware	24				40.0				1.067	8	2	2	0	
Maris Piper	24				44.0				1.071	7	2	1	0	
Nadine	24				46.0				1.051	10	1	1	0	
Trial 01PE8.	May planted ware district trial at Mandogalup 2001. Maris Piper was selected.													
Delaware	24	12.3	41.6	0.8	54.7	0.3	8.2	164	1.065	6.3	1.2	1.8	3	-
Maris Piper	24	16.6	40.7	0.0	57.4	0.0	9.6	133	1.073	7.7	1.2	1.8	0	-
Nadine	24	19.3	30.6	0.0	49.9	0.0	10.9	127	1.054	9.0	1.0	1.2	0	-
LSD 5%		3.3	6.5	skew	5.5	skew	1.2	14	0.003	1.2	skew	skew		
Trial 02AL39PE.	May planted demonstration at Mandogalup, 2002. Maris Piper was selected								Cooking tests‡					
									SG	taste	mash	micro	fry	
Delaware	25	12.1	42.4	1.8	56.3	0.3	8.8	137	1.071	**	**	**	*	0
Maris Piper	30	7.6	30.4	1.2	39.2	0.3	8.9	135	1.070	**	**	**	*	20
Nadine	25	9.4	20.1	1.6	31.1	0.7	7.4	120	1.054	nr	**	**	nr	0

Disease screenings

Trials 01PE10 & 02AL40. Autumn planted disease screenings at Baldivis, 2001 & 02.

	Powdery scab					Crocodile skin				
	01PE10		02AL40!		overall rating	01PE10		02AL40		overall rating
	SI~	Rating	SI~	Rating		SI~	Rating	SI~	Rating	
Desiree	1.87	tol	0.44	tol	tol	0.38	h sus	1.07	h sus	h sus
Maris Piper	1.04	tol	0.29	tol	tol	0.06	tol	0.04	tol	tol
Nadine	2.26	tol	0.80	tol	tol	0.01	tol	0.08	tol	tol
LSD 5%	0.41		1.32			0.27		0.18		
LSD 1%	0.54		1.74			0.36		0.23		

*Tuber characteristics; **bold** type = good, plain type = questionable, *italic* = poor.
Samples assessed visually: If crisp indicated then scale 1 - 10, 7 = borderline for French-fries, >7 = too dark.
† Flesh faults; † indicates significantly different internal disorders from Delaware.
‡ Cooking tests: nr = not recommended, * = fair, ** = good, *** = excellent
~ SI = Severity index = ((no. tubers 0-5% surface affected)+(tubers 5-25% x 2) + (tubers >25% x 3))/total no. tubers
If ns greater from control (Desiree for scab & Nadine for croc skin) then entry is classed as "tolerant"
If sig greater (P=0.05) than control the entry is classed as "susceptible"
If highly sig diff (P=0.01) from control then entry is classed as "highly susceptible."
! For these trials severity index is an arcsin transformation

10.3 95-11-20 (Auski)

Breeding and appearance

95-11-20 (Auski) was bred at the National Potato Improvement Centre in Victoria by Dr Roger Kirkham. Its parents were Denali x 79-5-2 (Knox). When planted in November 95-11-20 (Auski) produces smooth, cream skinned, round tubers with slightly deep eyes and a shallow heel. Shape can be a little uneven and distorted however it is far superior to the shape and appearance of Delaware.

Performance

95-11-20 (Auski) performed best in October/November experiments but also performed well in July plantings. These results are summarised below and in Table 10.3.1 and 10.3.2 respectively.

October/November plantings

In the eleventh series of experiments 95-11-20 (Auski) was selected for its performance at Manjimup (Table 9.2.6). It was not selected in twelfth series due to lenticels marring its appearance, nevertheless it had superior appearance to Delaware in this demonstration (Table 9.3.8). In the thirteenth series 95-11-20 (Auski) was selected in the November planted demonstration where it had good bloom and cooking quality, although its appearance was not ideal.

The data in Table 10.3.1 shows that in the five October/November planted tests 95-11-20 (Auski) had better appearance than Delaware in every test. It also had equal appearance to Nadine in three of the five tests. The need for new varieties in this planting is a replacement for Delaware, not Nadine. To provide an improvement to consumers and growers alike the replacement for Delaware needs to have equal cooking quality with improved appearance and high yield like Nadine.

The averages shown in Table 10.3.1. indicate that these criteria have been met. Average yield for 95-11-20 (Auski) was 67 t/ha which was 7 t/ha ahead of Nadine and 11 t/ha ahead of Delaware. Culinary quality tests in three demonstrations show that 95-11-20 (Auski) had better taste than Nadine and equal taste to Delaware (Table 10.3.1). In all five October/November plantings 95-11-20's (Auski's) frying colour was lighter than Delaware (and of course much lighter than Nadine) and in the three demonstrations its French-fry quality was superior to Delaware. After-cooking-darkening was darker for 95-11-20 (Auski) than either Delaware or Nadine: 95-11-20 (Auski) scored 2.0 compared with Delaware's 1.5 and Nadine's 1. (Table 10.3.1). However Western Potatoes rated salad quality of 95-11-20 (Auski) as excellent in the three October/November planted demonstrations. This shows that this did not affect salad quality (Table 10.3.l). Mashing quality, as tested in the demonstrations, was similar to the standards: it scored better than the standards in 2000 equal to them in 2001 but worse in 2001 (Table 10.3.1). 95-11-20 (Auski) had similar acceptable quality compared with Delaware and Nadine (Table 10.3.1). 95-11-20 had similar boiling quality to the standards with a slough score of 0.9: Delaware scored 1.0 and Nadine was 0.8. Bloom was similar to Nadine but much better than Delaware (Table 10.3.1). Specific gravity was 1.063 in October/November plantings which was lower than Delaware's 1.068 but higher than Nadine's 1.055. In the five experiments shown in Table 10.3.2 95-11-20 (Auski) was

planted 24-25 cm apart in the rows. In the demonstrations, where farmers spacings are used, 95-11-20 (Auski) was planted at the lowest density of 53,333 plants per ha (25 cm in-row spacing) compared with Delaware's 83,333 plants/ha (16 cm) and Nadine's 74,074 plants/ha (18 cm).

Benefits compared with Delaware from October/November plantings.

- better appearance,
- better skin bloom,
- 20% higher marketable yield,
- equal taste
- lighter fry colour and large tubers will produce better fresh chips,
- can be planted at a lower density than Delaware.

Disadvantages compared with Delaware from October/November plantings.

- darker after-cooking-darkening.

Table 10.3.1. Summary of October/November plantings of the 11th to 13th series of experiments of 95-11-20 (Auski).

Entry & tuber* characteristics	Spac-ing in rows (cm)	Yield (t/ha)					Tuber no. per plant	Quality						
		Small 0-70g	Medi-um 70-120g	Large 120-350g	Grade No. 1 70-450g	Over-size >450g		SG	Fry# color (F fry)	ACD	Sloug-hing	Flesh faults (%)†	Cd@ (mg/kg fwt)	Bloom after 14 d
Averages across all October/November planted experiments														
October/November plantings, n = 5								(n=6)	(n=3)				(n=1)	(n=3)
Delaware		17.3	35.8	2.8	55.8	0.8	5.5	1.068	3.3	1.5	1.0	1	0.040	0
Nadine		21.8	35.6	1.6	60.0	1.0	12.0	1.055	7.3	1.2	0.8	12	0.037	35
95-11-20 (Auski)		15.4	41.9	6.3	66.9	1.1	9.9	1.063	2.7	2.0	0.9	6	0.051	31
Eleventh or "95" series of experiments														
Trial 98BU4.	October planted replicated screening at Margaret River 1998. 95-11-20 (Auski) selected. (Dawson & Mortimore 2000)								Crisp					
Delaware	15	57.6	25.6	2.5	85.7	0.0	7.3	1.073	4.0	1.3	2.3	0	-	-
Nadine	24	45.5	18.9	1.1	65.5	0.0	12.1	1.050	9.0	1.3	1.0	10	-	-
95-11-20 (Auski)	24	38.5	37.3	8.1	83.5	1.0	10.3	1.063	4.0	1.5	1.0	10	-	-
LSD 5%		15.6	9.8	skew	18.4	skew	1.9	0.007	1.9	0.9	skew	ns		
Trial 99MA7.	November planted ware district trial at Manjimup 1999. 95-11-20 selected. (Dawson & Mortimore 2000)													
Delaware	15	7.0	29.5	2.7	39.2	0.9	4.1	1.070	7.0	2.3	1.7	3	0.040	-
Nadine	24	15.8	40.6	1.9	58.2	2.9	11.6	1.050	10.0	1.8	1.0	43†	0.037	-
95-11-20 (Auski)	24	9.0	48.5	5.4	62.9	0.9	8.2	1.063	6.0	4.3	1.5	17	0.051 ns	-
LSD 5%		4.3	9.4	skew	9.9	skew	1.4	0.005	1.9	0.8	0.9		0.021	
Trial 00MA2.	October planted demonstration at Manjimup, 2000. 95-11-20 (Auski) selected								Cooking tests‡					
									taste	salad	mash	micro	fry	
Delaware	18	4.9	41.3	6.8	53.0	2.5	5.2	1.067	**	***	**	**	*	0
Nadine	18	13.8	44.2	4.2	62.1	1.4	10.9	1.052	*	***	**	**	nr	88
95-11-20 (Auski)	25	7.9	50.2	11.3	69.4	2.3	10.4	1.068	**	***	***	***	**	44
Twelfth or "96" series of experiments														
Trial 01MA12	October planted demonstration at Manjimup, 2001.													
Delaware	15	9.1	54.0	1.7	64.8	0.5	6.3	1.067	**	***	**	*	**	0
Nadine	15	17.1	59.1	0.8	77.0	0.6	10.2	1.056	*	***	**	**	nr	0
95-11-20 (Auski)	25	6.7	54.1	3.5	64.2	1.3	10.2	1.069	**	***	**	*	***	0
Thirteenth or "97" series of experiments														
Trial 02AL39BU3.	November planted demonstration at Pemberton, 2002.													
Delaware	15	3.0	7.7	28.6	0.2	36.5	4.5	1.065	**	***	**	**	**	0
Nadine	20	13.6	17.2	20.1	0.0	37.3	15.2	1.053	nr	***	***	**	nr	16
95-11-20 (Auski)	25	4.8	8.4	42.5	3.0	53.9	10.2	1.072	**	***	*	***	***	48
Disease screenings	See previous table (Table 10.2.1)													

*Tuber characteristics; **bold** type = good, plain type = questionable, *italic* = poor.
Samples assessed visually: 1 - 10, 7 = borderline for French-fries, >7 = too dark.
† Flesh faults; † indicates significantly different internal disorders from Delaware.
@ Cd = cadmium - maximum permitted concentration = 0.1 mg/kg fresh weight.
‡ Cooking tests: nr = not recommended, * = fair, ** = good, *** = excellent

July plantings

In the twelfth and thirteenth series of experiments 95-11-20 (Auski) was selected at both double crop planting times (Tables 9.3.7.1 & 2 and 9.4.10.1 & 2). A summary of the July planting results is given in Table 10.3.2. The July planted demonstration of the thirteenth series was really a failure and so these results have not been included in the averages shown in Table 10.3.2.

In the three trials that grew well 95-11-20 (Auski) had improved appearance over Delaware and improved post harvest skin bloom. It had similar yield and cooking quality to Delaware. Compared with Nadine it had improved post harvest skin bloom, specific gravity and lighter fry colour.

Benefits compared with Delaware and Nadine from July plantings.

- better appearance than Delaware,
- lighter fry colour and large tubers can be used for fresh chips compared with Nadine,
- better skin bloom,
- potential for saved seed to perform well for the following autumn grown crop unlike saved seed of Nadine, and
- improved tolerance to crocodile skin compared with Delaware.

Disadvantages compared with Delaware and Nadine from July plantings.

- More susceptible to powdery scab than Delaware.

Conclusions

95-11-20 (Auski) should be tested on a small commercial scale in October/November plantings at Manjimup/Pemberton. It should be tested against 95-37-12 (Billabong) at this time (see Section 10.4).

If it is successful there then it should also be considered for commercial tests in the double crop system of the Swan Coastal Plain.

Table 10.3.2. Summary of July plantings of the 11th to 13th series of experiments of 95-11-20 (Auski).

Entry & tuber* characteristics	Spac-ing in rows (cm)	Yield (t/ha)					Tuber no. per plant	Quality						
		Small 0-70g	Medi-um 70-120g	Large 120-350g	Grade No. 1 70-450g	Over-size >450g		SG	Fry# color (F fry)	ACD	Sloug-hing	Flesh faults (%)†	Cd@ (mg/kg fwt)	Bloom after 14 d
Average s of 3 July planted experiments														
July plantings, n = 3														
Delaware					59.5	0.0	10.3	1.071	4.3	1.1	1.4	6	-	7
Nadine					55.5	0.0	9.5	1.056	8.3	1.0	1.0	1	-	20
95-11-20 (Auski)					59.0	0.0	8.1	1.069	4.3	1.0	1.0	11	-	51
Eleventh or "95" series of experiments														
Trial 99HA1A.	July planted ware district trial at Myalup 1999. 95-11-20 selected (Dawson & Mortimore 2000)													
									Crisp					
Delaware	20	22.2	19.1	0.0	46.1	0.0	8.0	1.069	6.0	1.3	1.3	0	-	20
Nadine	24	20.0	33.2	0.8	43.4	0.4	9.6	1.056	9.0	1.0	1.0	3	-	60
95-11-20 (Auski)	24	11.6	36.6	0.9	55.0	0.0	8.1	1.069	6.0	1.0	1.0	10	-	64
LSD 5%		4.3	7.6	skew	8.9	skew	0.7	0.003	1.9	0.5	0.4	ns		
Trial 00HA2A.	July planted demonstration at Myalup, 2000. Auski not selected due to lack of bloom.								Cooking tests‡					
									taste	salad	mash	micro	fry	
Delaware	20	14.6	64.8	0.3	79.7	0.0	11.1	1.072	**	**	*	**	*	0
Nadine	20	9.3	54.8	0.5	64.7	0.0	7.8	1.055	nr	***	**	**	nr	0
95-11-20 (Auski)	25	2.6	51.9	12.4	66.9	5.1	8.0	1.069	***	***	**	***	**	0
Twelfth or "96" series of experiments														
Trial 01BU5A.	July planted demonstration at Jindong, 2001. Auski selected.													
Delaware	25	20.5	29.3	2.8	52.6	0.0	11.8	1.073	**	**	**	**	*	0
Nadine	25	12.4	37.8	8.0	58.3	1.0	11.1	1.057	*	***	**	**	nr	0
95-11-20 (Auski)	20	11.8	43.5	0.0	55.2	0.0	8.1	1.069	**	***	**	**	***	88
Thirteenth or "97" series of experiments														
Trial 02AL39BU1	July planted demonstration at Busselton, 2002. Poor growth, 95-11-20 (Auski) selected.													
Delaware	25	15.3	1.3	0.0	16.6	0.0	12.8	1.061	**	**	**	**	*	100
Nadine	25	16.4	10.1	0.0	26.5	0.0	7.7	1.064	*	***	**	**	nr	92
95-11-20 (Auski)	20	11.3	9.8	0.0	21.1	0.0	9.6	1.055	**	***	**	**	***	100

Disease screenings

Trials 99PE6 & 00PE4. Autumn planted disease screenings at Baldivis, 1999 & 2000.

	Powdery scab			Crocodile skin		
	Severity index 99PE6	00PE4	Susceptibility rating over both trials	Severity index 99PE6	00PE4	Susceptibility rating over both trials
Delaware	0.40	0.40	tolerant	1.21	0.97	highly susceptible
Desiree	0.04	0.01	tolerant control	2.45	2.02	highly susceptible
Nadine	0.70	0.78	highly susceptible	0.09	0.26	tolerant control
95-11-20 (Auski)	1.20	1.24	highly susceptible	0.08	0.02	tolerant
LSD 5%	0.42	0.47		0.27	0.26	
LSD 1%	0.55	0.62		0.36	0.35	

*Tuber characteristics; **bold** type = good, plain type = questionable, *italic* = poor.
Samples assessed visually: 1 - 10, 7 = borderline for French-fries, >7 = too dark.
† Flesh faults; † indicates significantly different internal disorders from Delaware.
@ Cd = cadmium - maximum permitted concentration = 0.1 mg/kg fresh weight.
‡ Cooking tests: nr = not recommended, * = fair, ** = good, *** = excellent

10.4 95-37-12 (Billabong)

Breeding and appearance

95-37-12 (Billabong) was bred at the National Potato Improvement Centre in Victoria by Dr Roger Kirkham. Its parents were Mondial x 85-30-12. When planted in November 95-37-12 (Billabong) produces flat-oblong tubers with slightly netted cream skin with light-yellow flesh.

Performance

95-37-12 (Billabong) was selected in the November planted demonstration of the thirteenth series as well as the July and February planted demonstrations. These results are discussed further below. More emphasis is given to the November results because of the poor growth of the July and February demonstrations

October/November plantings

Results from these plantings are collated in Table 10.4.1. In the November planted demonstration at Pemberton 95-37-12 (Billabong) had suitable tuber characteristics, so was similar to Nadine but superior to Delaware. Tubers are flat oblong with slightly netted, cream skin with light yellow flesh. Eyes and heel are shallow. Yield was greater than Nadine and Delaware but the trial was not high yielding. 95-37-12 (Billabong) had more versatile culinary quality than Nadine, no major faults and cadmium not significantly greater than Delaware. 95-37-12 (Billabong) had the best bloom with 68% of tubers shining after two weeks storage compared with 16% for Nadine and 0% for Delaware. At this demonstration 95-37-12 (Billabong) was the industry's choice with 28 votes compared to Nadine's 10 and 95-11-20's (Auski's) 9.

Benefits compared with Delaware and Nadine from October/November plantings.

- better appearance than Delaware,
- higher specific gravity than Delaware and Nadine,
- better fry quality than Delaware and Nadine,
- better taste than Nadine,
- better post harvest skin bloom than Delaware and Nadine.

Disadvantages compared with Delaware and Nadine from October/November plantings

- light yellow flesh.

Table 10.4.1. Summary of October/November plantings of the 13th series of experiments of 95-37-12 (Billabong).

Entry & tuber* characteristics	Spacing in rows (cm)	Yield (t/ha)					Tuber no. per plant	Quality						
		Small 70-120g	Medium 120-350g	Large 350-450g	Grade No. 1 70-450g	Oversize >450g		SG	Fry# color (crisp)	ACD	Slugging	Flesh faults (%)†	Cd@ (mg/kg fwt)	Bloom after 14 d
Averages across all October/November planted experiments														
October/November plantings, n = 3														(n=1)
Delaware		10.5	43.8	1.3	55.6	0.2	5.6	1.067	5.1	2.3	1.5	2	-	0
Nadine		16.7	36.5	1.0	54.2	0.5	21.7	1.054	8.6	1.2	1.1	5	-	16
95-37-12 (B'bong)		10.8	38.2	1.7	50.6	0.9	9.2	1.074	4.2	3.0	1.0	1	-	68
Individual experiments of the 13th or "97" series														
Trial 00BU2. November planted replicated screening at Margaret River 2000. 95-37-12 selected.														
Delaware	15	14.1	55.9	0.4	70.4	0.0	6.2	1.065	5.0	3.3	2.0	0	-	-
Nadine	24	17.4	50.4	1.1	68.8	0.5	14.8	1.052	9.0	1.3	1.0	10	-	-
95-37-12 (B'bong)	24	13.6	42.3	2.1	58.1	1.0	8.6	1.070	5.0	2.8	1.0	0	-	-
LSD 5%		6.2	15.6		18.4	skew	2.1	0.006	1.8	1.5	1.0			
Trial 01MA11. October planted ware district trial at Manjimup 2001. 95-37-12 selected.														
Delaware	15	9.6	46.9	3.4	59.9	0.3	6.0	1.070	7.3	2.7	1.5	3	-	-
Nadine	15	15.5	39.1	1.9	56.4	1.0	8.0	1.056	9.7	1.3	1.2	0	-	-
95-37-12 (B'bong)	24	8.8	38.9	2.4	50.1	1.1	7.8	1.076	5.7	3.2	1.0	3	-	-
LSD 5%		4.5	9.0	skew	9.1	skew	1.3	0.004	1.6	0.9	0.7			
Trial 02AL39BU3 November planted demonstration at Pemberton, 2002.									Cooking tests‡					
									taste	salad	mash	micro	fry	
Delaware	15	7.7	28.6	0.2	36.5	0.2	4.5	1.065	**	***	**	**	**	0
Nadine	20	17.2	20.1	0.0	37.3	0.0	15.2	1.053	nr	***	***	**	nr	16
95-37-12 (B'bong)	25	9.9	33.3	0.5	43.7	0.6	11.3	1.076	**	***	*	*	***	68
Disease screenings See previous table (Table 10.3.1)														

*Tuber characteristics; **bold** type = good, plain type = questionable, *italic* = poor.
Samples assessed visually: If crisp indicated then scale 1 - 10, 7 = borderline for French-fries, >7 = too dark.
If French-fry indicated then scale 1 – 7, 4 = borderline for French-fries, >4 = too dark.
† Flesh faults; † indicates significantly different internal disorders from Delaware.
@ Cd = cadmium - maximum permitted concentration = 0.1 mg/kg fresh weight.
‡ Cooking tests: nr = not recommended, * = fair, ** = good, *** = excellent
! For these trials severity index is an arcsin transformation

July plantings

Results from these plantings are collated in Table 10.4.2. In the July planted demonstration 95-37-12 (Billabong) had superior culinary quality to most other entries (Table 9.4.10.1) as it rated "excellent" in all categories except for "fry" where its rating was good. It had good appearance, as indicated by its suitable tuber characteristics. Yield was low in this experiment which had growth problems. Out of two July plantings 95-37-12 (Billabong) has had lower yield on average than Delaware or Nadine.

Benefits compared with Delaware and Nadine from July plantings.

- higher specific gravity,
- better fry quality than Nadine,
- better taste than Nadine,
- better skin quality than Delaware,
- shallower eyes than Delaware.

Disadvantages compared with Delaware and Nadine from July plantings

- lower yield,
- light yellow flesh.

Conclusions

95-37-12 (Billabong) should be tested on a small commercial scale in October/November plantings at Manjimup/Pemberton where it could be an attractive replacement for Delaware. It should be tested against 95-11-20 (Auski) at this time.

If it is successful there then 95-37-12 (Billabong) should also be considered for commercial tests in the double crop system of the Swan Coastal Plain.

Table 10.4.2. Summary of July plantings of the 13th series of experiments of 95-37-12 (Billabong).

Entry & tuber* characteristics	Spac-ing in rows (cm)	Yield (t/ha)					Tuber no. per plant	Quality						
		Small 70-120g	Medi-um 120-350g	Large 350-450g	Grade No. 1 70-450g	Over-size >450g		SG	Fry# color (crisp)	ACD	Sloug-hing	Flesh faults (%)†	Cd@ (mg/kg fwt)	Bloom after 14 d
Averages across all July planted experiments														
July plantings, n = 2														(n=1)
Delaware		19.0	25.2	0.0	44.2	0.0	12.5	1.066	4.9	1.2	1.2	11	-	100
Nadine		14.8	28.8	0.0	43.6	0.4	9.4	1.056	7.5	1.1	1.1	2	-	92
95-37-12 (B'bong)		12.6	22.3	0.3	35.2	0.0	7.3	1.070	4.5	1.1	1.0	0	-	100
Individual experiments of the 13th or "97" series														
Trial 01BU4A. July planted ware district trial at Jindong 2001. 95-37-12 selected.														
Delaware	24	22.7	49.1	0.0	71.8	0.0	12.2	1.070	5.7	1.3	1.3	10	-	-
Nadine	24	13.2	47.5	0.0	60.7	0.7	9.1	1.056	9.0	1.2	1.2	3	-	-
95-37-12 (B'bong)	24	13.7	39.5	0.5	53.7	0.0	8.6	1.074	6.0	1.2	1.0	0	-	-
LSD 5%		5.1	10.6	skew	8.8	skew	1.2	0.004	2.1	0.5	skew			
Trial 02AL39BU1 July planted demonstration at Jindong, 2002.									Cooking tests‡					
									taste	salad	mash	micro	fry	
Delaware	25	15.3	1.3	0.0	16.6	0.0	12.8	1.061	**	**	**	**	*	100
Nadine	25	16.4	10.1	0.0	26.5	0.0	9.6	1.055	nr	***	**	**	nr	92
95-37-12 (B'bong)	30	11.5	5.0	0.0	16.6	0.0	5.9	1.065	***	***	***	***	**	100

Disease screenings

Trials 01PE10 & 02AL40. Autumn planted disease screenings at Baldivis, 2001 & 2002.

	Powdery scab					Crocodile skin				
	01PE10		02AL40!		overall rating	01PE10		02AL40		overall rating
	SI~	Rating	SI~	Rating		SI~	Rating	SI~	Rating	
Desiree	1.87	tol	0.44	tol	tol	0.38	h sus	1.07	h sus	h sus
Nadine	2.26	tol	0.80	tol	tol	0.01	tol	0.08	tol	tol
95-37-12 (Billabong)	2.52	h sus	-	-		0.28	tol	-	-	
LSD 5%	0.41		1.32			0.27		0.18		
LSD 1%	0.54		1.74			0.36		0.23		

*Tuber characteristics; **bold** type = good, plain type = questionable, *italic* = poor.
Samples assessed visually: If crisp indicated then scale 1 - 10, 7 = borderline for French-fries, >7 = too dark.
If French-fry indicated then scale 1 – 7, 4 = borderline for French-fries, >4 = too dark.
† Flesh faults; † indicates significantly different internal disorders from Delaware.
@ Cd = cadmium - maximum permitted concentration = 0.1 mg/kg fresh weight.
‡ Cooking tests: nr = not recommended, * = fair, ** = good, *** = excellent
~ SI = Severity index = ((no. tubers 0-5% surface affected)+(tubers 5-25% x 2) + (tubers >25% x 3))/total no. tubers
If ns greater from control (Desiree for scab & Nadine for croc skin) then entry is classed as "tolerant"
If sig greater (P=0.05) than control the entry is classed as "susceptible"
If highly sig diff (P=0.01) from control then entry is classed as "highly susceptible."
! For these trials severity index is an arcsin transformation

10.5 96-141-12 (Windsor)

Breeding and appearance

96-141-12 was bred in Australia at the National Potato Improvement Centre in Victoria. Its parents were 89-12-1 (Eureka) and 88-102-24. Both parents are French-fry breeding lines although 89-12-1 was tested in WA as a fresh market variety. When planted in May at 25 cm 96-141-12 (Windsor) produces large oblong tubers with slightly deep eyes, shallow heel and smooth skin. Flesh colour is white.

Performance

96-141-12 was selected for its performance in May plantings because it may provide the industry with an early French-fry variety that has suitable appearance for the fresh market. Table 10.5.1 provides a summary of results for 96-141-12 (Windsor) at this planting time.

When compared with 89-12-1 (Eureka) 96-141-12 (Windsor) had equal French-fry cooking quality, similar yield and specific gravity (Table 9.3.6.1) but larger tuber size. Average tuber size of 96-141-12 (Windsor) in the May demonstration was 185 g compared with 89-12-1's (Eureka's) 129 g (Table 9.3.6.2). In this demonstration 96-141-12's (Windsor's) specific gravity and fry colour was similar to 89-12-1's (Eureka's): SG values were 1.072 and 1.071 while fry score was 3 and 3 respectively.

It is also worth comparing 96-141-12 (Windsor) with Atlantic. These were both planted in the May district trial in 2000 (Sections 9.3.2 & 5.3.2). Here Atlantic produced similar yield to 96-141-12 (Windsor): 39.4 t/ha compared with 40.5. However Atlantic had much higher specific gravity {1.092 compared with 96-141-12's (Windsor's) 1.081} and lighter fry colour (3.3 compared with 6.7).

Another variety that should be compared with 96-141-12(Windsor) is 97-38-2 (White Star). which was also selected for its performance from May plantings. Although 97-38-2 (White Star) was selected for the fresh market it also has light fry colour although specific gravity is probably less than 96-141-12 (Windsor). These two varieties have not been directly compared yet although 96-141-12 (Windsor) was planted in a demonstration that was adjacent to the district trial in which 97-38-2 (White Star) was planted. Here specific gravity and fry colour for 96-141-12 (Windsor) and 97-38-2 (White Star) were similar (Table 10.5.2). 97-38-1 (White Star) is more tolerant of powdery scab than 96-141-12 (Windsor) (Tables 10.5.1 & 10.6.1) and this could give 97-38-2 (White Star) an advantage over 96-141-12 (Windsor). The two varieties should be tested together to determine whether 96-141-12 (Windsor) has an advantage over 97-38-2 (White Star). ***Benefits***

- Potential early French-fry variety with suitable appearance for the fresh market,
- Larger tubers than 89-12-1 (Eureka),

Disadvantages

- 96-141-12 (Windsor) appears to be susceptible to powdery scab.

Conclusion

96-141-12 (Windsor) should be tested with 97-38-2 (White Star) in May plantings for suitability for French-fry processing.

Table 10.5.1. Summary of the May plantings of the twelfth series of experiments of 96-141-12 (Windsor).

Entry & tuber* characteristics	Spac-ing in rows (cm)	Yield (t/ha)					Tuber no. per plant	Quality						
		Small 70-120g	Medi-um 120-350g	Large 350-450g	Grade No. 1 70-450g	Over-size >450g		SG	Fry# color (Crisp)	ACD	Sloug-hing	Flesh faults (%)†	Cd@ (mg/kg fwt)	Bloom after 14 d
Averages across May planted experiments (winter screening excepted)														
May plantings, n = 2								(n=1)						(n=1)
89-12-1 (Eureka)		7.4	41.2	0.8	49.4	0.2	6.4	1.076	4.5	1.3	2.3	0		
96-141-12 (Windsor)		4.5	38.6	4.0	47.1	0.3	5.8	1.077	4.9	1.4	2.9	4		
Individual experiments of the 12th or "96" series														
Trial 00PE2. May planted ware district trial at Mandogalup 2000. 96-141-12 was selected.														
89-12-1 (Eureka)	20	5.1	41.2	1.5	47.8	0.3	4.7	1.080	6.0	1.5	2.5	0	-	-
96-141-12 (Windsor)	24	4.1	34.1	2.2	40.5	0.0	5.0	1.081	6.7	1.8	2.7	3	-	-
LSD 5%		3.1	7.4	skew	7.7	ns	0.9	0.004	1.1	0.1	0.8	ns		
Trial 01PE9. **May planted demonstration at Mandogalup, 2001.**														
89-12-1 (Eureka)	20	9.7	41.1	0.0	50.9	0.0	8.0	1.071	3	1	2	0	-	
96-141-12 (Windsor)	25	4.9	43.0	5.8	53.7	0.6	6.5	1.072	3	1	3	4	-	
Disease screenings														
Trials 00PE4, 01PE10 & 02AL40. Autumn planted disease screenings at Baldivis, 2000-03.														

	Powdery scab							Crocodile skin						
	00PE4		01PE10		02AL40!		O'all	00PE4		01PE10		02AL40		
	SI~	Rating	SI~	Rating	SI~	Rating		SI~	Rating	SI~	Rating	SI~	Rating	
Desiree	0.01	tol	1.87	tol	0.44	tol	tol	2.02	h sus	0.38	h sus	1.07	h sus	h sus
Nadine	0.78	h sus	2.26	tol	0.80	tol	tol	0.26	tol	0.01	tol	0.08	tol	tol
97-141-12 (Windsor)	0.28	tol	2.43	h sus	1.80	sus	sus	0.62	h sus	0.04	tol	0.21	tol	tol
LSD 5%	0.47		0.41		1.32			0.26		0.27		0.18		
LSD 1%	0.62		0.54		1.74			0.35		0.36		0.23		

*Tuber characteristics; **bold** type = good, plain type = questionable, *italic* = poor.
Samples assessed visually: If crisp indicated then scale 1 - 10, 7 = borderline for French-fries, >7 = too dark.
† Flesh faults; † indicates significantly different internal disorders from Delaware.
‡ Cooking tests: nr = not recommended, * = fair, ** = good, *** = excellent
~ SI = Severity index = ((no. tubers 0-5% surface affected)+(tubers 5-25% x 2) + (tubers >25% x 3))/total no. tubers
If ns greater from control (Desiree for scab & Nadine for croc skin) then entry is classed as "tolerant"
If sig greater (P=0.05) than control the entry is classed as "susceptible"
If highly sig diff (P=0.01) from control then entry is classed as "highly susceptible."
! For these trials severity index is an arcsin transformation

Table 10.5.2. Comparison of 96-141-12 (Windsor) and 97-38-2 (White Star) from adjacent plots in different experiments planted in May 2001.

Variety	Experiment	Section where reported	Measurement	
			SG	Fry colour
96-141-12 (Windsor)	01PE9	9.3.6	1.072	3
97-38-2 (White Star)	01PE8	9.4.5	1.071	4.3

10.6 97-38-2 (White Star)

Breeding and appearance

97-38-2 (White Star) was bred in Australia at the National Potato Improvement Centre in Victoria by Dr Roger Kirkham. Its parents were Gladiator x the breeding line 91-158-6. When planted in May at 30 cm it produces oblong tubers with shallow eyes and heel. Skin texture is smooth and skin and flesh colour are cream.

Performance

97-38-2 (White Star) was tested in the thirteenth series of experiments where it was outstanding May plantings. It also performed well in July plantings. These results are described below and summarised in Tables 10.6.1 and 10.6.2.

May plantings

In a May planted unreplicated screening at Baldivis (Table 10.6.1, Trial 00PE1) 97-38-2 (White Star) was selected as it performed better than the standard varieties. It had suitable tuber characteristics compared with the questionable tuber characteristics of Delaware and Nadine. 97-38-2 (White Star) had similar specific gravity to Delaware and higher specific gravity compared with Nadine. Crisp colour of 97-38-2 (White Star) was lighter than Delaware while after-cooking-darkening and slough scores were equal to or better than Delaware (Table 10.6.1).

In a May 2001 planted district trial 97-38-2 (White Star) had improved tuber characteristics compared with Delaware and Nadine. 97-38-2 (White Star) had significantly higher specific gravity than Delaware and had equal or better boiling scores compared with Delaware. Fry colour of 97-38-2 (White Star) was much lighter than Delaware. Yield of 97-38-2 (White Star) was similar to Delaware. 97-38-2 (White Star) produced tubers with an average weight of 167 grams which were smaller than Delaware's (164 g) but larger than Nadine (127 g).

In a May 2002 planted demonstration 97-38-2 (White Star) produced suitable tuber characteristics and the best culinary quality along with 90-40-1 (Ruby Lou). 97-38-2's (White Star's) yield of 47 t/ha was lower yield than Delaware's 56 t/ha but higher than Nadine's 31 t/ha.

97-38-2 (White Star) was shown to be tolerant of powdery scab and it had the same tolerance to crocodile skin as Nadine (resistant control).

Commercial May planted trials

97-38-2 (White Star) was grown in small scale commercial trials in 2002 where half a tonne of seed was planted at two sites. Western Potatoes followed the potatoes through to the retail chain and surveyed customers. Their findings were that 97-38-2 (White Star) scored fairly high for both appearance and taste (Dawson *et al.* 2003). Pack-outs were assessed and 97-38-2 (White Star) produced a pack-out of 82% Premium & Class 1 with just 9% Class 2 (Dawson *et al.* 2003). This was a substantially better pack-out than Nadine which had 52% Premium and Class 1 with 21% Class 2. The two wash packers involved were happy with 97-38-2's (White Star's) washing performance.

Benefits compared with Delaware and Nadine from May plantings.

- better appearance than Delaware,
- better yield than Nadine,
- larger tubers than Delaware and Nadine,
- better fry quality than Delaware and Nadine,
- more tolerant to crocodile skin than Delaware,

Disadvantages compared with Nadine from May plantings.

- PCN resistance is not known. Parents of 97-38-2 (White Star) are Gladiator x 91-158-6. Gladiator is PCN resistant (*Globodera pallida* and *G. rostochiensis*) so there is at least a 50% chance that White Star is also resistant.

July plantings

In a July 2001 planted district trial 97-38-2 (White Star) had improved tuber characteristics compared with Delaware. 97-38-2 (White Star) had significantly higher specific gravity than Nadine and had equal or better boiling scores compared with Delaware. Fry colour of 97-38-2 (White Star) was lighter than Delaware and, of course Nadine. Yield of 97-38-2 (White Star) was 63t/ha which was lower than Delaware's 72 t/ha but similar to Nadine's 61 t/ha.

In a July 2002 planted demonstration 97-38-2 (White Star) had better tuber characteristics than Delaware and better culinary quality than Nadine. Yields in this experiment were poor and so yield results should be discounted.

Benefits compared with Delaware and Nadine from July plantings.

- better appearance than Delaware,
- better culinary quality than Nadine.

Disadvantages compared with Delaware from July plantings.

- Yield may be lower than Delaware.

Conclusion

97-38-2 (White Star) should be tested on a commercial scale in April and May plantings to see whether it fulfils its promise of providing a more attractive potato than Delaware with better cooking quality than Nadine and larger tubers than both.

Table 10.6.1 Summary of May plantings of the 13th series of experiments of 97-38-2 (White Star).

Entry & tuber* characteristics	Spac-ing in rows (cm)	Yield (t/ha)					Tuber		Quality					
		Small 70-120g	Medi-um 120-350g	Large 350-450g	Grade No. 1 70-450g	Over-size >450g	no. per plant	av mkt wt (g)	SG	Fry# color (Crisp)	ACD	Sloug-hing	Flesh faults (%)†	Bloom after 14 d
Averages across May planted experiments (winter screening excepted)														
May plantings, n = 2									(n=1)					(n=1)
Delaware		12.2	42.0	1.3	55.5	0.3	8.5	151	1.068	5.2	1.1	1.9	1.5	-
Nadine		14.4	25.4	0.8	40.5	0.4	9.2	124	1.054	8.5	1.0	1.1	0.0	-
97-38-2 (W'Star)		5.1	46.1	0.9	52.1	0.2	8.0	166	1.070	3.7	1.0	1.5	0.0	-
Individual experiments of the 13th or "97" series														
Trial 00PE1.	May planted unreplicated winter screening at Baldivis 2000. 97-38-2 was selected.													
Delaware	24				40.0				1.067	8	2	2	0	-
Nadine	24				46.0				1.051	10	1	1	0	-
95-38-2 (W'Star)	24				50.0				1.065	5	1	1	0	-
Trial 01PE8.	May planted ware district trial at Mandogalup 2001. 97-38-2 was selected.													
Delaware	24	12.3	41.6	0.8	54.7	0.3	8.2	164	1.065	6.3	1.2	1.8	3	-
Nadine	24	19.3	30.6	0.0	49.9	0.0	10.9	127	1.054	9.0	1.0	1.2	0	-
97-38-2 (W'Star)	30	5.2	51.0	0.6	56.9	0.3	8.6	167	1.071	4.3	1.0	1.0	0	-
LSD 5%		3.3	6.5	skew	5.5	skew	1.2	14	0.003	1.2	skew	skew		
Trial 02AL39PE.	May planted demonstration at Mandogalup, 2002.								Cooking tests‡					
									SG	taste	mash	micro	fry	
Delaware	25	12.1	42.4	1.8	56.3	0.3	8.8	137	1.071	**	**	**	*	0
Nadine	25	9.4	20.1	1.6	31.1	0.7	7.4	120	1.054	nr	**	**	nr	0
97-38-2 (W'Star)	30	4.9	41.2	1.2	47.3	0.0	7.3	165	1.068	**	***	***	**	4

	Powdery scab					Crocodile skin				
Disease screenings										
Trials 01PE10 & 02AL40. Autumn planted disease screenings at Baldivis, 2001 & 2002.										
	01PE10		02AL40!		overall rating	01PE10		02AL40		overall rating
	SI~	Rating	SI~	Rating		SI~	Rating	SI~	Rating	
Desiree	1.87	tol	0.44	tol	tol	0.38	h sus	1.07	h sus	h sus
Nadine	2.26	tol	0.80	tol	tol	0.01	tol	0.08	tol	tol
97-38-2 (W'Star)	2.01	tol	1.58	tol	tol	0.01	tol	0.13	tol	tol
LSD 5%	0.41		1.32			0.27		0.18		
LSD 1%	0.54		1.74			0.36		0.23		

*Tuber characteristics; **bold** type = good, plain type = questionable, *italic* = poor.
Samples assessed visually: If crisp indicated then scale 1 - 10, 7 = borderline for French-fries, >7 = too dark.
† Flesh faults; † indicates significantly different internal disorders from Delaware.
‡ Cooking tests: nr = not recommended, * = fair, ** = good, *** = excellent
~ SI = Severity index = ((no. tubers 0-5% surface affected)+(tubers 5-25% x 2) + (tubers >25% x 3))/total no. tubers
If ns greater from control (Desiree for scab & Nadine for croc skin) then entry is classed as "tolerant"
If sig greater (P=0.05) than control the entry is classed as "susceptible"
If highly sig diff (P=0.01) from control then entry is classed as "highly susceptible."
! For these trials severity index is an arcsin transformation

Table 10.6.2. Summary of July plantings of the 13th series of experiments of 97-38-2 (White Star).

Entry & tuber* characteristics	Spacing in rows (cm)	Yield (t/ha)					Tuber no. per plant	Quality						
		Small 70-120g	Medium 120-350g	Large 350-450g	Grade No. 1 70-450g	Oversize >450g		SG	Fry# color (Crisp)	ACD	Sloughing	Flesh faults (%)†	Cd@ (mg/kg fwt)	Bloom after 14 d
Averages across all July planted experiments														
July plantings, n = 2									(n=1)					(n=1)
Delaware		19.0	25.2	0.0	44.2	0.0	12.5	1.066	6	1.2	1.2	11	-	100
Nadine		14.8	28.8	0.0	43.6	0.4	9.4	1.056	9	1.1	1.1	2	-	92
97-38-2 (W'Star)		10.9	34.6	0.0	45.5	0.0	7.4	1.067	4	2.4	1.1	0	-	100
Individual experiments of the 13th or "97" series														
Trial 01BU4A. July planted ware district trial at Jindong 2001. 95-37-12 selected.														
Delaware	24	22.7	49.1	0.0	71.8	0.0	12.2	1.070	5.7	1.3	1.3	10	-	-
Nadine	24	13.2	47.5	0.0	60.7	0.7	9.1	1.056	9.0	1.2	1.2	3	-	-
97-38-2 (W'Star)	24	7.1	56.1	0.0	63.2	0.0	8.0	1.070	4.3	1.7	1.2	0	-	-
LSD 5%		5.1	10.6	skew	8.8	skew	1.2	0.004	2.1	0.5	skew			
Trial 02AL39BU1. July planted demonstration at Jindong, 2002, affected by herbicide and insufficient fertiliser									Cooking tests‡					
									taste	salad	mash	micro	fry	
Delaware	25	15.3	1.3	0.0	16.6	0.0	12.8	1.061	**	**	**	**	*	100
Nadine	25	16.4	10.1	0.0	26.5	0.0	9.6	1.055	nr	***	**	**	nr	92
97-38-2 (W'Star)	25	14.7	13.1	0.0	27.8	0.0	6.8	1.064	**	***	***	**	*	100
Disease screenings See previous table (Table 10.?1)														

*Tuber characteristics; **bold** type = good, plain type = questionable, *italic* = poor.
Samples assessed visually: If crisp indicated then scale 1 - 10, 7 = borderline for French-fries, >7 = too dark.
† Flesh faults; † indicates significantly different internal disorders from Delaware.
@ Cd = cadmium - maximum permitted concentration = 0.1 mg/kg fresh weight.
‡ Cooking tests: nr = not recommended, * = fair, ** = good, *** = excellent

10.7 Outcomes achieved compared with objectives

Varieties were sought which improved upon the standard varieties Delaware and Nadine. New varieties that had improved appearance over Delaware and more versatile culinary quality than Nadine were required. Improvements also sought included greater tolerance of diseases, pests and physiological disorders. The following five selections show that the objectives of the project have been met.

Maris Piper and 97-38-2 (White Star) were suited to winter production. Compared with the standard varieties Delaware and Nadine they had improved appearance and pack-out. Maris Piper also had improved resistance to powdery scab as well as resistance to PCN which gives it an advantage over Delaware. 97-38-2 (White Star) had more versatile cooking quality and yield than Nadine as well as larger tubers and better fry quality than Delaware and Nadine.

95-11-20 (Auski) was suited to summer production where, compared with Delaware, it had a 20% higher marketable yield, larger tubers, better appearance, better skin bloom and lighter fry colour. 95-37-12 (Billabong) was selected for summer production too where it had better appearance than Delaware, higher specific gravity and better taste than Nadine with better post harvest skin bloom and fry quality than Delaware and Nadine.

96-141-12 (Windsor) was identified as a potential early French-fry variety with suitable appearance for the fresh market. It had larger tubers than 89-12-1 (Eureka) which is the closest, existing commercial variety.

11. Technology Transfer

11.1 Demonstrations

The major method of technology transfer was the use of on-farm demonstrations to show, under commercial conditions, the performance of our selections to growers and industry representatives. The demonstrations contained the best varieties from the previous season's district trial and they allowed growers and industry representatives to participate in the selection of new varieties. In the last two years of the project, farmers and industry representatives were asked, at the start of the field day, to inspect the unlabelled, harvested plots. The harvested tubers were laid out on the ground for easy inspections and comparison of plots (see Frontispiece). The farmers and industry representatives were then asked to vote for their top three varieties using a simple 1, 2, 3 vote. All votes were used to determine the industry's favourites. First, or "1" votes were multiplied by 3. Second, or "2" votes were ultiplied by 2 while third votes were simply added to give a final ranking of votes. Subsequent discussions then concentrated on these most popular varieties.

The methodology is further described in Section 4.2. A list of the 18 demonstrations, held as part of this project, is given shown below.

These demonstrations require considerable resources, probably near to one third of the project's costs. Efficiencies can be made by planting them on the same site as the district trial.

The value of demonstrations is illustrated by the enthusiasm with which participating growers will proceed to the next step of small scale commercial testing. The latest example is 95-37-12 (White Star). This variety was tested commercially as a direct result of demonstrations.

List of demonstrations

Crisp demonstrations

page
Experiment 00MA8 - October planted demonstration, eleventh series 20
Experiment 01HA3A - July planted demonstration, eleventh series 21
Experiment 01HA3B - March planted demonstration, eleventh series 21
Experiment 02AL39BU4 - October planted demonstration, thirteenth series 37

French-fry demonstrations

Experiment 00MA9 – November planted demonstration, 10th, 11th & 12th series 60
Experiment 01MA33 - November planted demonstration, 10th, 11th & 12th series 62

Fresh market demonstrations

Experiment 00PE3 - May planted demonstration, eleventh series 85
Experiment 00HA2A - July planted demonstrations, eleventh series 86
Experiments 00HA2B - February planted demonstrations, eleventh series 86

Experiment 00MA2 - October planted demonstration, eleventh series 89
Experiment 01PE9 - May planted demonstration, twelfth series 100
Experiments 01BU5A - July planted demonstrations, twelfth series 102
Experiments 01BU5B - January planted demonstrations, twelfth series 102
Experiment 01MA12 – October planted demonstration, twelfth series 106
Experiment 02AL39PE - May planted demonstration, thirteenth series 124
Experiments 02AL39BU1 - July planted demonstration, thirteenth series 126
Experiments 02AL39BU2 - February planted demonstration, thirteenth series 126
Experiment 02AL39BU3 - November planted demonstration, thirteenth series 129

11.2 Publications

Demonstration handouts

A pamphlet was produced for all demonstrations. This pamphlet contained funding acknowledgements plus a summary of previous results and benefits of varieties on display.

Research Summaries

All replicated screening, district trials and demonstrations were submitted annually for publication annually *in Potato cultivar trials in Australia,* published by Agriculture Victoria (e.g Kirkham 2000). Unfortunately Kirkham (2000) was the last time this booklet was published.

Annual trial summaries were also submitted to the Potato Producers Committee of the Agricultural Produce Commission in 2001, 2002 and 2003.

Extension Publications

- *Potato Australia*
  Three articles were published in Potato Australia (Dawson *et al.* 2002, Kirkham et al. 2001 & Kirkham et al. 2000)

- *Potato Grower*
  Three articles were published in the Potato Grower (Western Australia) (Dawson & Mortimore 2001, Dawson & Freimand 2001, Dawson et al. 2003)

- Farmnotes
  Two Department of Agriculture Farmnotes were produced (Dawson & Mortimore 2002a, Dawson & Mortimore 2002b).
- Posters
  One poster *Quantum Leaps through Genetic Revolution* was produced during the course of the project

11.3 Potato Variety Commercialisation Group.

This group was formed to coordinate the identification and commercial development of potato varieties for ware consumption in the West Australian market. Membership was from the Department of Agriculture and Western Potatoes supply and marketing staff. This group meant that the relationship between potato variety evaluation research and Western Potatoes

was formalised and has resulted in more careful planing of the development of new varieties selected by the Department of Agriculture.

12. Recommendations

Previous recommendations

Four recommendations were made in the previous project (Dawson & Mortimore (2000).

1. That the NaPIES continues along with local screening of breeder's lines continues in WA.
2. That demonstration plantings be incorporated into all NaPIES activities.
3. Industry should develop protocols to allow the objective commercial assessment of new varieties. These protocols should include a seed supply plan as well as measures to reduce risk to growers who wish to develop new varieties on behalf of industry.
4. NaPIES should incorporate an agronomy profile project so that the correct production procedures can be determined for the most promising new varieties.

The NaPIES program has been taken over by the National Evaluation & Commercialisation Committee for the Fresh Potato Breeding Program (FNECC). The new testing procedures developed by FNECC have addressed recommendations 2, 3 and 4.

The first recommendation stands.

New Recommendations

1. That the publication *Potato Cultivar Trials in Australia* should re-commence. This publication was very useful as it allowed easy access to the performance of breeding lines across Australia. Even more useful would be a web based, database for all Australian breeding line evaluations. This would allow earlier and easier access to information on new varieties.
2. Consideration should be given to targeting variety evaluation work to specific production problems. This is because the FNECC plan requires commercialisation as well as variety evaluation. Focusing on a specific problem will enable increased workload to be done without greatly increasing costs.

13. Acknowledgements

Funding

Most funding for WA potato variety evaluation was provided through the Horticulture Program of the Department of Agriculture, Western Australia. Agriculture Victoria supplied breeding lines and imported varieties. Industry funds provided for this project were contributed by the Horticultural Australian Limited and the Potato Producers Committee of the Agricultural Produce Commission.

Experimental sites

Most expoerimetns were conducted in growers' commercial crops. Their assistance and expert crop husbandry is greatly appreciated.

14. Literature

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15. Abbreviations

ACD	after cooking darkening
a.k.a.	also known as
cd	cadmium
cf.	compared with
dk	dark
FNECC	National Evaluation and Commercialisation Committee for the Fresh Potato Breeding Program
fwt	fresh weight
g	grams
h	highly
ha	hectare
micro	microwave
MPC	maximum permitted concentration
NaPIES	National Potato Improvement & Evaluation Scheme
NPIC	National Potato Improvement Centre
nr	not recommended
ns	not significant
PCN	potato cyst nematode
PVY	potato virus Y
SG	specific gravity
sus(c)	susceptible
t	tonnes
tc	tuber characterisitcs
tol	tolerant
WA	Western Australia
wks	weeks