

Apricot breeding lines for processing

Darren Graetz
South Australian Research & Development Institute
(SARDI)

Project Number: CF09003

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Horticulture Australia Ltd
Project CF09003 (May 2013)

FINAL REPORT

Apricot breeding lines for processing

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SARDI



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Apricot breeding lines for processing

Final Report (May 2013)

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Purpose:

This study was undertaken to assess if material within the apricot breeding program for dried apricots located at Loxton have commercial potential as processing varieties. The attributes of crosses within the program had not previously been fully evaluated as a canned product.

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Media summary

New SA bred apricot varieties offer excellent processing alternatives

A new apricot selection named “Bounty”, developed within the SARDI apricot breeding program has produced excellent results over several years of evaluation, proceeding through larger commercial trial plantings to commercial release. It has bright prospects to reduce the current dependence of the Australian processing sector on the single apricot variety Trevatt. Another recently identified line producing outstanding results over the past two seasons requires fast tracking along the evaluation and commercialisation pathway.

Several other new apricot lines still require evaluation to finalize the screening of the SARDI apricot breeding programs for its processing potential.

The commercial release of “Bounty” is an excellent practical outcome for the canning industry. The release of at least one further new processing apricot variety is likely to be realised from this research project.

Cropping of the new variety “Bounty” in the Shepparton area still needs to be fully evaluated, early results are very encouraging. Trial trees of this new variety at the Loxton Research Centre have cropped heavily in most seasons and over a wide range of seasonal conditions.

This project to select and evaluate potential new varieties suitable for processing utilises the substantial research in apricot breeding being carried out by the South Australian Research and Development Institute (SARDI) at Loxton.

The apricot industry’s reliance on one variety restricts the time that apricots can be processed, limits the total tonnage possible, and exposes growers and processors to high levels of risk from seasonal events. Substantial annual variations in tonnage also occur due to the biennial bearing nature of the existing traditional variety, Trevatt.

In an attempt to overcome its reliance on Trevatt, the industry has evaluated several other commercial varieties but, until now, only “Bounty” has proven suitable.

Technical summary

Introduction. This study was undertaken to select and evaluate material within the apricot breeding program located at Loxton for commercial potential as processing varieties. This project builds on the work previously performed in HAL project FR05010. The attributes of many crosses within this program originally set up to breed new drying apricot varieties had not previously been evaluated as a canned product.

Methods. In this project a total of 48 selections from the apricot breeding program have been evaluated for their commercial potential as a processing variety (assessed as a canned product). These selections were identified through annual screening of crosses as they commence cropping in the primary evaluation blocks of the apricot breeding program based at Loxton along with selections previously identified within the program and maintained in secondary evaluation blocks. In excess of 39,000 crosses have been produced and screened over the life of the breeding program.

In each year, canning of nominated selections was conducted by SPC Ardmona, with the quality of the processed product assessed by an experienced panel. Selections that had acceptable quality when canned continued to be evaluated in subsequent years, unless they were rejected from consideration on the basis of cropping or other production related issues.

Propagation material of the outstanding selections (under non propagation agreements) was supplied for the establishment of trees in the Shepparton district for future assessment in the district in which commercial planting is anticipated.

Results and discussion. In this project one new variety, “Bounty” has proceeded to commercial release and another selection 32255 identified as a distinct commercial prospect that should be fast tracked into larger scale commercial evaluation. A further two selections appear worthy of further evaluation by the Australian processing apricot industry. Only a small group of lines remain unscreened to complete the investigation of the processing potential within the apricot breeding program. These outputs and outcomes are in line with the envisaged expectations of the project.

Commercial release and industry adoption of “Bounty” as a new processing apricot variety is well underway and is being managed by SPC Ardmona.

Technology transfer. This project is primarily focussed on identifying new apricot varieties to be utilised in the Australian processing sector that will improve the reliability of supply of suitable quality apricots to SPC Ardmona. As such, technology transfer activities in this project have focussed on maintaining a good level of communication and exchange of project findings between project staff and representatives of SPC Ardmona. Communication has also occurred between project staff and the growers nominated by SPC Ardmona to which evaluation trees have been supplied in the Shepparton district.

Information of a general nature has been published each year about the project in the HAL Canned Fruit Annual Industry Report. A grower information sheet has been produced for “Bounty”. This publication has been utilised in grower communications by SPC Ardmona in the commercial release of “Bounty”.

Recommendations. It is now important that the commercial release of “Bounty” continue to be supported and that the exciting commercial prospect, selection 32255, be fast tracked into further large scale evaluation and possible future commercial release. A new project should be developed to facilitate commercial test planting of this selection and also to progress the other two selections of interest should they continue to meet or exceed the commercial requirements for a processing variety. The SARDI Apricot Breeding Program still has a small number of

promising new canning style lines for evaluation next season from the currently planted genetic material at the Loxton Research Centre.

Introduction

The apricot processing industry in Australia is dependant on a single variety, namely Trevatt. Reliance on one variety restricts the time that apricots can be processed, limiting the total tonnage possible. Relying on one variety also exposes growers and the processor to a high level of risk from seasonal events. Additionally, substantial annual variation in the tonnage currently occurs due to the biennial bearing nature of Trevatt. In an attempt to overcome its reliance on Trevatt, the industry has evaluated other commercial varieties. Patterson was the only variety to show potential for processing and was progressed to testing on a commercial scale. Unfortunately problems were encountered, with flavour in the canned product being dependant on fruit having reached an acceptable maturity. Texture of the fruit once processed also became compromised at maturites delivering acceptable flavour. The industry was still faced with reliance on a single variety.

The South Australian Research and Development Institute (SARDI), a division of the Department of Primary Industries and Resources South Australia (PIRSA), currently conducts a substantial apricot breeding program at Loxton. To date, the major emphasis placed on the evaluation of crosses from this program for their canning potential was in the form of work conducted under the previous HAL Project FR05010. This project and discussions between SARDI and SPC Ardmona (SPCA) have identified that some of the material being bred at Loxton shows significant potential to provide the apricot processing industry with alternative varieties.

Based on the results and recommendations of HAL Project FR05010 and follow up site visits by members of SPCA it was decided a follow-on project should be initiated to further identify and unlock the processing potential of apricot lines within the SARDI apricot breeding program and ultimately commercialise this potential. This project aims to provide the canning industry with new varieties by capitalising on the substantial ongoing effort in apricot breeding by SARDI at Loxton.

Material and methods

Material available for testing

Until 2009 the SARDI apricot breeding program had been producing 2000-4000 trees annually from crosses aimed at producing new varieties for the drying industry. In total about 39,100 seedlings of crosses were planted in primary selection blocks. As seedlings commenced cropping they were routinely screened for their drying potential as part of the project HAL DT09003 and preceding projects. Prior to this project the primary objective of screening was to identify varieties suitable for drying; however lines that may be particularly suitable for other sectors of the apricot industry, including for processing, have sometimes been noted in the program's assessment database. Lines identified that may have commercial potential are routinely budded and placed in secondary evaluation blocks. A number of selections noted as having processing potential had already been propagated and placed in secondary evaluation blocks in the years preceding this project. These selections were evaluated by canning in this project and its predecessor FR05010.

Numerous other lines of significant potential (including for processing) within the program have been maintained as the original seedling trees for evaluation on an ongoing basis until a decision on their commercial potential is made. These selections, along with those discovered during the life of this project in primary evaluation blocks were evaluated by canning in this project.

Selection Criteria

Prior to the commencement of this project the noting of selections with processing potential was based on basic characteristics such as very firm, uniformly mature fruit with little or no blush and free stones. At the commencement Project FR05010, specific criteria and assessments for canning were developed and incorporated into the screening process. These were developed in conjunction with managerial and technical staff of SPC Ardmona. SARDI project staff also met with a number of SPC Ardmona's key suppliers of apricots to gain an orchard production and harvesting perspective. Requirements for an apricot canning variety as developed are listed in Table 1.

Breakdown of texture and the development of undesirable flavours during canning were known to be likely sources of rejection for many selections put forward. Unfortunately, a method to screen out selections for these traits on the basis of easily measurable fresh fruit characteristics is not available from either SPC Ardmona or the literature. Experience gained in FR05010 shows that simply meeting the physical and aesthetic fresh fruit specifications are no guarantee of success in the canned product and that the attrition rate in identifying good quality canned lines should be expected to be very high. The results from FR05010 in identifying "Bounty" (Selection 3444) also show that outstanding successes are possible.

Table 1: Requirements for an apricot canning variety

Attribute	Criteria
Fruit	
Size	Minimum 1 ½ inches , preferred 1 ¾ inches (measured tip first through sizing ring)
Shape	Needs to align on suture for cutting machines, compressed cheeks. Not round or irregular.
Colour	Apricot, Not red or pale. Even colouration through fruit important
Blush	Nil preferred (but this may be negotiable)
Firmness	Firm at canning maturity, capability for mechanical harvesting
Stone	Need to be completely free Prefer small stones
Total Soluble Solids	No minimum
Flavour	Apricot flavour is important (Comparator: flavour of ‘Patterson’ is borderline)
Blemish	No blemish is a critical Not prone to rain cracking No freckle or scab
pH	pH ≤ 4.3
Tree	
Timing of harvest maturity	Trevatt or earlier preferred Variety would be considered for up to 12 days after Trevatt
Nature of harvest maturity	Uniform throughout tree, capability for mechanical harvesting Fruit holds on tree (does not drop)
Timing of Flowering	Trevatt or later preferred
Yield	Consistent, non-biennial bearer Essential for it to be as good or better than Trevatt

Selection of lines to be tested by canning

Database search for existing selections of interest

As part of the laboratory fruit assessment carried out on lines within the Loxton apricot breeding program prior to commencement of this project, lines that were considered to have attributes particularly suitable for the processing sector were on occasions earmarked in the program's database. In each year of this project, information contained in the apricot breeding program database was reviewed to compile a list of lines considered worthwhile to submit for processing and evaluation as a canned product.

Annual screening of primary evaluation blocks for new selections

Prior to this project only FR05010 had placed emphasis on the selection of varieties for the processing sector. During the duration of this project additional selection criteria were added to the screening process based on the criteria set out in Table 1. Greatest emphasis was placed on finding apricot selections suitable for processing during the maturity window 12 days either side of when Trevatt is harvested. Table 2 lists the numbers of crosses that were screened in each of the years of this project, along with the numbers of selections from the Loxton apricot breeding program that were then evaluated by canning in each year. Higher numbers of new selections were canned in the first 2 years, as previously identified selections from secondary evaluation blocks were included as well as newly discovered lines and as the pool of available new lines rapidly diminished and was not replaced by new plantings coming into production. In the last season, the focus was shifted to re-evaluating lines of interest with only 1 new selection being evaluated.

Table 2: Numbers of crosses screened from the apricot breeding program at Loxton and number of selections evaluated by canning in each year of the project

Season	Number of crosses screened	Number of new selections canned	Total number of selections canned
Year 5 – 2009/10	1590	9	20
Year 6 – 2010/11	4264	22	39
Year 7 – 2011/12	1836	6	20
Year 8 – 2012/13	1247	1	5

Harvesting, fruit storage and shipment

In each season a list of selections for evaluation by canning was prepared prior to commencement of apricot harvesting within the Loxton apricot breeding program. This was because current selection and evaluation practices for new lines allow lines to get overly mature for canning before they are identified. Pre-selection enables lines to be specifically monitored and target harvested at an appropriate maturity for canning. As discovery of apricot varieties in the program is an ongoing process, additional lines were added during each of the seasons, based on that season's primary evaluation data.

Lines were identified from the SARDI Apricot Breeding Program to broadly fit a range of criteria, average size (1 ¾ inch), shape (needs to align on machines), colour (normal apricot), blush (nil preferred), maturity (uniform over tree, no dropping, mechanical capability), firmness (firm), stones (completely free), TSS and flavour (no minimum, not too acid, apricot flavour), timing (Trevatt or earlier), blemish (No blemish, rain cracking, freckle or scab), flowering (Trevatt or earlier) and yield (consistent, non-biennial bearer as good or better than Trevatt). Samples of 2-5 kg were harvested from trees of the selections to be processed. After harvest fruit was cooled to 2°C and samples accumulated in the cool store before being packed in styrofoam boxes and transported from Loxton to SPC Ardmona in batches.

Each season of the project great effort was put into sourcing fruit samples at the appropriate maturity stage. Hot weather and other circumstances often impact on this task. A guide was developed to rate fruit maturity for canning prior to it leaving cold storage at Loxton using C= canning maturity + or – to signify fruit that was more or less mature than desirable according to the breeders experience. Fruit was generally picked at a reasonable stage of maturity. However, this did not ensure that all fruit samples at the time of processing were of good quality. Storage associated with accumulating samples for transport, coupled with the actual transportation and delays in processing in some instances resulted in deterioration in the quality of some selections prior to canning. This was recorded and is documented in the results. These impacts have been taken into account when interpreting canning results and making decisions regarding the potential of individual selections.

Fresh fruit assessment and canning evaluation

Pre-processing

In all seasons observations on harvest date, crop load, maturity rating, size, texture / firmness, ground colour, blemish and blush were conducted on the fresh fruit of each selection using consistent experienced personnel. Comments were also noted on characteristics such as blemish, bruising, ripeness, freeness of stone and presence of pit burn or rots.

Canning

Samples were canned in light syrup (20 °Brix) using a standard apricot cook in a rotary cooker (11 minutes at 100°C). The number of 75mm diameter or 470gm (420gm net) cans processed varied according to quantity of sound fruit available. Normally 7 to 10 cans were processed.

Post-canning

In each year the canned samples were opened and the quality of the fruit halves assessed at SPC Ardmona by a consistent group of experienced assessors. Fruit was scored for each of the attributes of overall appearance, colour, texture and flavour using rating scales. Specific notes were recorded on characteristics such as stone fragments, dark spots, mixed quality, uneven colour or texture, air bubbles or separation of the skin.

Results

Processing Assessment of apricot breeding lines

Year 5 – 2009/2010 season

During the 09/10 season 20 apricot samples from the SARDA Apricot Breeding Program were selected (Table 3) and sent to SPC Ardmona at Shepparton for investigation of their canning potential. These lines represented 17 different genotypes. All lines were subjected to a pre-cooking analysis of size, flesh texture, colour and overall quality rating (Table 4). Lines were then canned in light syrup (20 °Brix) using a standard apricot cook in a rotary cooker (11 minutes at 100°C). After canning the lines were further assessed for appearance (overall, colour, blemish, blush), flavour and texture/firmness (Table 5).

Cropping of apricots in the 2009/10 season in the Riverland was generally light, most likely a result of inadequate winter chill (27 % below average). Several significant rainfall events occurred during the harvest season along with a hail event resulting in widespread fruit damage the effects of which are recorded in Table 4.

Line 3444, which is the most advanced of the selections, produced its first light crop on record. Previously this selection has always produced moderate to very heavy crops at the Loxton Research Centre. Due to the light crop, fruit was larger than desirable for canning and somewhat softer than in previous seasons. When processed, line 3444 performed acceptably, being rated good for appearance, colour and texture, and between good and excellent for flavour. In contrast to trees growing at Loxton this season, line 3444 planted in the Shepparton district produced heavy crops of excellent quality fruit for processing. Fruit was used by SPC Ardmona for a production test and performed very well through their standard apricot process. Quality of the finished product was excellent with even texture, colour and a very good apricot flavour. The variety is solid, thick walled and retains its structure and integrity through the canning process. There was a reasonably high incidence of off-suture units however the level was not considered abnormal compared to the standard variety, Trevatt.

A sample of Line 4162, which is also an advanced selection, rated best overall out of the 20 samples processed. This fruit was harvested at a very firm maturity (half colour) from trees having a light crop. This line has been assessed for 4 seasons and appears to perform best when harvested early. The canned fruit of a second sample harvested 10 days later (full colour but still firm) had poor flavour and lacked texture. Further evaluation is required to determine optimum harvest maturity and tolerance in fruit maturity for processing.

Of the 17 lines tested for canning potential this season, 9 had never been assessed before. Line 25223 gave promising results and will be included in future testing, another four of the new lines (5386, 5550, 25689, 25912) are also worthy of a second year of evaluation. Of other lines previously identified with canning potential and retested this season, Line 16340 performed well and 16222 performed acceptably. Based on this season and the previous 3 seasons results, both lines should be considered for test planting of several trees in the Shepparton district.

Four lines (15530, 16655, 17513, 21661) that had previously shown some potential, this season either performed poorly or were barely acceptable and are not going to be further considered.

The following lines were also investigated during harvest in the 2009/10 season but not submitted to SPC/Ardmona for canning trials.

11215- Good colour with little blush, minimal cracking but has rain damaged by developing brown withered patches, maybe too mature. Only submit if it looks much better next season.

17871- Pale flesh colour with pebbly skin surface. Reject from further evaluation.

21648- Smallish fruit with good firmness, some rain cracking at the stem end after 8mm of rain, has Trevatt shape but has quite a bit of blush. Submit next season.

22040- Very free stone, quite a bit of speckled blush, good flattened round shape, very little rain damage. Submit next season.

24992- Sample was insufficient to submit, 38mm of rain had caused moderate splitting around stem cavity. Submit next season.

25226- Good fruit quality even after 8mm of rain, has uneven halves and pronounced suture on one side, heart shaped. Submit next season.

28017- Firm but too much speckled blush and rain splitting around the stem with uneven halves. Only submit if it looks much better next season.

28277- Too big for canning. Reject from further evaluation.

29261- Selected from fresh assessments, heavy crop, clean standard apricot appearance but may be too round to align consistently. Canning evaluation to be a high priority next season.

32460- Looks perfect for canning, uniform apricot, compressed cheeks, no defects, blush or rain cracking and reasonably firm, only a small amount fruit available from a small tree. Canning evaluation to be a high priority next season.

Table 3: Harvest date, maturity rating, tree crop load, fruit size and overall quality of fresh fruit of apricot breeding line selections assessed for canning in the 2009/010 at Loxton Research Centre point of harvest.

Selection	Harvest date	Maturity rating	Crop load	Fruit Size (width mm)	Overall quality	Comment
3444	27/11/09	C+	Light	53	Good	Fruit oversized and a little softer than normal for maturity
4162(a)	4/12/09	C-	Light	42	Excellent	Excellent but picked early, on a light crop doesn't oversize like 3444
4162(b)	14/12/09	C+	Light	45	Good	Far more mature sample of 4162, very yellow but still firm%
4244	11/12/09	C+	Light	48	Good	Has some skin marking, brown shrivel that needs checking
5386	30/11/09	C+	Light moderate	46	Ok	Seems inside out ripening, could bruise or squash
5550	14/12/09	C	Very light	52	Variable	Small sample from a very lightly cropped tree, maturity Ok but size variable, generally too big
7543	18/11/09	C	Moderately heavy	40	Excellent	Good prospect
13971	14/12/09	C+	Light	44	Good	Some hail marks, picked late afternoon
15530(a)	11/12/09	C	Light	45	Ok	Heavily graded sample could be rejected on shape, size, blush and open suture
15530(b)	11/12/09	C	Light	45	Ok	Appears to have too much blush and open suture
16222	2/12/09	C	Moderate	54	Good	Fruit from a tree with health issues
16340	25/11/09	C	Moderately heavy	48	Excellent	Excellent, some hail marks and fruit a bit large
17513(a)	18/11/09	C	Heavy	43	Excellent	Excellent
17513(b)	23/11/09	C	Heavy	36	Good	Same as (a) but from a different tree after 38mm of rain
21661	19/11/09	C	Moderate	37	Excellent	Possibly a little small for crop load

Table 3 Continued: Harvest date, maturity rating, tree crop load, fruit size and overall quality of fresh fruit of apricot breeding line selections assessed for canning in the 2009/010 at Loxton Research Centre point of harvest.

Selection	Harvest date	Maturity rating	Crop load	Fruit Size (width mm)	Overall quality	Comment
25223	20/11/09	C	Moderate	40	Excellent	Lots of hail marking for which it was heavily graded
25689	15/12/09	C+	Light moderate	42	Ok	Has a hollow at the stem end extending into stone cavity, requires checking
25912	15/12/09	C	Heavy	41	Good	Excellent off tree and looks great when picked
27227	15/12/09	C+	Light	40	Ok	Concerns over soft and bruised fruit in the sample
31066	4/12/09	C-	Moderately heavy	34	Good	Bit small but looks good otherwise

Table 4: Size, texture, colour, blemish level and overall score out of 10 for fresh fruit of apricot breeding line selections prior to canning in the 2009/10 season by SPC/Ardmona

Characteristics of fresh fruit						
Selection	Size	Texture	Colour	Blemish	Score	Comments
3444	small	firm	orange/red blush	slight	7	generally sound
4162(a)	medium	firm	orange	major	4	poor quality
4162(b)	mixed	medium	bright orange	medium	2	poor quality
4244	extra large	medium	light orange	medium	3	poor quality
5386	large	soft	pale orange	medium	6	average
5550	extra large	medium	yellow/ orange	slight	6	generally sound
7543	small	Soft/ medium	pale orange/red blush	major	5	average
13971	medium	Soft/ medium	orange/red blush	medium	2-	poor quality
15530(a)	large	medium	orange/red blush	major	2	poor quality
15530(b)	medium	firm	orange/red blush	major	2	poor quality
16222	medium	medium	orange/red blush	slight	6	stones hard to remove
16340	large	medium/ firm	orange/red blush	slight	7	generally sound
17513(a)	small	firm	orange/red blush	slight	7	generally sound t
17513(b)	small	firm	orange/red blush	medium	6	generally sound
21661	small	soft	orange	slight	5	too small
25223	small/ medium	medium	bright orange/red blush	slight	7	generally sound
25689	medium	mixed	yellow/red blush	slight	4	mixed maturity
25912	medium	medium	orange/red blush	slight	7	good quality
27227	small	medium	orange/red blush	medium	3	poor quality
31066	small	soft	orange/red blush	major	3	poor quality

Table 5: Assessment scores for the quality of canned fruit of apricot breeding line selections assessed in the 2009/10 season. Scores are for individual attributes judged out of 5 (where 1-poor/soft, 3-good, 5-excellent/firm).

Selection	Assessment scores for characteristics of canned fruit					Comments
	Appearance	Colour	Flavour	Texture	Total	
3444	3	3	4	3	13	Acceptable
4162(a)	3	4	4	5	16	Acceptable; Good firm apricots
4162(b)	3	3	1	2	9	Soft with lose skins and poor flavour
4244	2	2	3	2	9	Reject: Soft and mushy
5386	1	2	4	1	8	Reject; Sloppy
5550	3	3	2	4	12	Ok but bland
7543	2	2.00	2	4	10	Reject; Mixed colour
13971	1	1	3	0	5	Reject: Mushy and very poor quality
15530(a)	0	2	3	0	5	Reject: Mushy
15530(b)	0	2	3.00	0	5	Reject: Mushy
16222	3	3	4	3	13	Acceptable
16340	3	4	3	5	15	Acceptable
17513(a)	2	3	3	11	11	Reject: Bland and small
17513(b)	3	2	1	4	10	Reject: Bland and small
21661	2	2	1	1	6	Reject: Broken down, poor flavour
25223	4	4	3	4	15	Acceptable
25689	3	3	4	2	12	Soft, good flavour
25912	3	4	2	2	11	Reject: Soft with loose skins and poor flavour
27227	2	2	3	2	9	Reject: Mushy
31066	2	3	3	2	10	Reject: small with loose skin

Acceptable – Canned fruit was rated as reasonable, good or excellent. Continue evaluation.
Reject – Selection does not warrant further evaluation due to poor quality of canned sample or another problem detected this season that renders the selection non-commercial as a processing variety.

Selections not classified “Acceptable” or “Reject” require further evaluation.

Year 6 – 2010/2011 season

During the 2010/11 season 39 apricot samples from the SARDI Apricot Breeding Program were selected and sent to SPC Ardmona at Shepparton for investigation of their canning potential. These lines represented 31 different genotypes, 22 of which had never been assessed before. The remaining 9 were selections shown to have potential in previous seasons. Samples of 1-2 kg were picked and stored for each line and sent in two batches for testing at Shepparton on 20/12/10 and 04/01/11. All lines were subjected to a pre-cooking analysis of size, flesh texture, colour and overall quality rating (Table 6). Lines were then canned in light syrup (20 °Brix) using a standard apricot cook in a rotary cooker (11 minutes at 100°C). After canning the lines were further assessed for appearance (overall, colour, blemish, blush), flavour and texture/firmness (Table 7).

Cropping of apricots in the 2010/11 season in the Riverland was generally heavy, in contrast to the previous season when crops were generally light. This resulted in a higher than normal number of lines being tested this season, as several lines on young small trees scheduled for last season had to be delayed to this season.

This season saw the identification of a new selection with excellent canned quality. Line 6432 assessed for the first time received a score of 18/20 (Table 7) based on its appearance, colour, flavour and texture which was the highest score achieved by a line this season. Four other new lines showed potential, without be outstanding.

Line 3444 (from here on referred to as “Bounty”) continues to impress. After experiencing its first light crop on record in the 2009/10 season “Bounty” set a very heavy crop in the 2010/11 season. As in the past, even with a very heavy crop load, “Bounty” produced fruit of appropriate size for canning requirements. Three samples were canned this season. The first sample of fruit was harvested when fruit had a tinge of green in the skin colour. This sample produced canned fruit with good to excellent quality ratings for appearance, colour, flavour and texture. The subsequent more mature samples harvested over the next 5 days produced a good quality canned product, but the processed fruit was not as good a flavour as the earlier picked fruit. The last sample was submitted to test the variety’s resilience to hot weather at harvest. Fruit at an advanced canning maturity was harvested two days after a three day hot period with daily maximum temperatures of 36.0, 37.6 and 43.6°C. Fruit had softened, when compared with earlier picked fruit, but was not showing any symptoms of pit burn. There was no discolouration of the fruit around the stone and fruit was juicy when broken open. When canned, the fruit was given a texture rating of 4/5 (where 3 is good and 5 is excellent). On the strength of these results and previous years it was decided that “Bounty” should continue through to commercial release.

Advanced lines 16222 and 16340 performed well, as has been the case for 4 out of the past 5 seasons. Line 16340 is larger than desired for processing. Its commercial future would depend on the market need for a large sized canned apricot. It would not be suitable for marketing under the same labels as the current Australian product. If a market arises for a large sized product, this variety seems suitable. Unlike other lines under consideration for processing, 16340 and 16222 also have good eating quality and other attributes for the fresh market.

The 2010/11 season confirmed that line 4162 must be harvested at an early maturity while extremely firm and while it has a substantial green hue to have good flavour. If 4162 fruit is left to ripen to a similar maturity to processing varieties, it has an unacceptable flavour. 4162 fruit harvested at early maturity is extremely durable which would be a substantial advantage in handling and, once processed, it has a good product colour. Delays in the harvest of this line result in the production of a product with insufficient flavour. This has been confirmed repeatedly over the past 3 seasons.

In the previous season line 25223 was identified for the first time, exhibiting good quality as a canned product. This season the tree carried a very heavy crop, resulting in smaller sized fruit than desired for processing. Three different maturity samples of this line were processed with three consistent, but disappointing results. Several days of rain (approximately 5mm per day) occurred in the days leading up to the first harvest which may have impacted on the results. Further testing is required to make a final determination on this line.

Of four other lines identified last season 5550 and 25912 processed poorly and will not be considered further. Canned product of line 25689 was good to excellent and will be considered further. Line 5386 was not retested this season.

There were 21 other lines tested for the first time this season. Of these, another 4 lines (14228, 25166, 26657 and 32263) performed acceptably. These lines should be retested, especially considering some were harvested during or after unfavourable weather. The remaining 17 lines performed poorly or were barely acceptable and are not going to be considered further.

Table 6: Harvest date, maturity rating, crop load on tree and characteristics of fresh fruit of apricot breeding line selections assessed for canning in the 2010/11 season.

Selection	Harvest date	Maturity Rating	Crop load	Characteristics of fresh fruit				
				Size	Texture	Ground Colour	Blush	Quality at time of processing and specific defects
3444(a)	28/12/10	C-	Very heavy	Large	Firm	Green/ Yellow	Slight	Excellent- slight marking and bruising
3444(b)	30/12/10	C	Very heavy	Large	Firm	Yellow/ Green		Excellent- some marks and bruising
3444(c)	2/1/11	C++	Very heavy	Large	Soft to firm	Yellow/ Orange		Excellent- bruising with some marks
4162(a)	28/12/10	C	Heavy	Medium	Firm	Orange	Red	Excellent- some marking
4162(b)	30/12/10	C-	Heavy	Medium/Large	Firm	Orange	Sl. Red	Excellent- slight marking
4162(c)	2/1/11	C+	Heavy	Medium	Firm	Orange	Red	Excellent- very little marking
5550	2/1/11	C	Heavy	Large	Firm	Yellow	Sl. Red	Excellent- slight marking
6166	19/12/10	C	Heavy	Medium	Firm	Yellow/ Green	Red	Good– bruising and slight marking
6432	19/12/10	C	Moderate Heavy	Medium/Large	Firm	Light Orange	Sl. Red	Excellent- some marks and bruising
14228	2/1/11	C-	Heavy	Medium/Large	Firm to hard	Green to Orange		Good- some damaged fruit bruised and marked
15172	28/12/10	C	Moderate	Large	Firm	Yellow	Sl. Red	Poor- marks and splits
16222	19/12/10	C	Heavy	Large	Firm	Yellow	Red	Excellent- minor blemish and very slight green tinge
16340	22/12/10	C	Heavy	Large	Firm	Orange	Red	Good- some marks and bruising
16530	13/12/10	C	Moderate Heavy	Large	Mixed firmness	Orange	Red	Excellent- slight blemish and slight green tinge
17871	22/12/10	C	Heavy	Medium	Firm	Orange	Rose	Good- some marks and bruising
18389	22/12/10	C	Moderate	Medium/Large	Firm to soft	Yellow	Red	OK- slight marks and some splits
21648	19/12/10	C	Heavy	Medium	Firm	Orange	Red	Excellent- slight blemish
23547	2/1/11	C+	Very Heavy	Medium/ Large	Firm	Yellow	Sl. Red	Excellent- some bruising and blemish

Table 6 Continued: Harvest date, maturity rating, crop load on tree and characteristics of fresh fruit of apricot breeding line selections assessed for canning in the 2010/11 season.

Selection	Harvest date	Maturity Rating	Crop load	Characteristics of fresh fruit				
				Size	Texture	Ground Colour	Blush	Quality at time of processing and specific defects
24992	6/12/10	C	Moderate Heavy	Medium	Medium/ Firm	Yellow	Red	Excellent- slight blemish
25166	22/12/10	C	Heavy	Small/Medium	Firm	Yellow/ Orange	Pink	Good- some marks and bruising
25223(a)	3/12/10	C-	Very heavy	Small/Medium	Firm	Orange	Red	Excellent- minor blemish
25223(b)	3/12/10	C+	Very heavy	Medium/Small	Medium	Orange	Red	Excellent- minor blemish
25223(c)	19/12/10	C++	Very heavy	Small	Medium	Orange	Red	Excellent- minor blemish
25226	19/12/10	C	Light Moderate	Medium/Large	Medium	Orange	Sl. Red	Excellent- some bruising and blemish
25689	28/12/10	C+	Moderate Heavy	Small/Medium	Firm	Orange	Sl. Pink	Good- a few slight marks
25912(a)	19/12/10	C-	Very Heavy	Medium	Firm	Yellow/ Orange	Red	Excellent- minor blemish
25912(b)	28/12/10	C+	Very Heavy	Large	Firm	Orange	Red	Excellent- some bruising and slight marks, some free stones
26657	28/12/10	C+	Heavy	Medium/Large	Firm	Orange	Sl. Red	Ok- some splits and slight marks
26779	2/1/11	C-	Heavy	Small	Firm	Orange	Sl. Red	Excellent- slight marks
27166	22/12/10	C	Heavy	Medium	Soft	Orange	Red	Excellent- some bruising and slight marking
29104	28/12/10	C	Moderate Heavy	Medium	Firm	Orange	Red	Excellent- slight marking and bruising
29261	2/1/11	C	Very Heavy	Small	Firm	Yellow	Sl. Red	Excellent- slight marking
31066	13/12/10	C	Moderate Heavy	Medium/Large	Medium	Yellow	Red	Excellent- slight blemish and some bruising
32228	6/12/10	C	Moderate	Medium/Small	Medium	Orange	Red	Good- slight blemish
32263	13/12/10	C	Light	Medium	Firm	Orange	Red	Good- slight blemish and bruising

Table 6 Continued: Harvest date, maturity rating, crop load on tree and characteristics of fresh fruit of apricot breeding line selections assessed for canning in the 2010/11 season.

Selection	Harvest date	Maturity Rating	Crop load	Characteristics of fresh fruit				
				Size	Texture	Ground Colour	Blush	Quality at time of processing and specific defects
32460	19/12/10	C	Light	Medium	Firm	Yellow/Green		Excellent- minor blemish
32957	2/1/11	C	Heavy	Medium	Firm	Green/Yellow		Excellent- very little marking
33996	20/12/10	C	Moderate	Small/Medium	Firm	Orange	Red	Good- slight marks and bruising
35944	20/12/10	C	Heavy	Medium	Firm	Orange	Red	Good- slight marks and bruising

Table 7: Assessment scores for the quality of canned fruit of apricot breeding line selections assessed in the 2010/11 season. Scores for individual attributes judged out of 5 (where 1-poor/soft, 3-good, 5-excellent/firm) and total is sum of the attribute scores (out of 20).

Selection	Assessment scores for characteristics of canned fruit					Comments
	Appearance	Colour	Flavour	Texture	Total	
3444(a)	4	3	4	5	16	Acceptable: Good, 2 nd best 2010/11
3444(b)	3	3	2	4	12	Acceptable
3444(c)	3	3	3	4	13	Acceptable: Some have bland flavour and missed texture
4162(a)	3	3	1	3	10	Reject
4162(b)	4	3	3	5	15	Acceptable: Good, equal 3 rd best 2010/11
4162(c)	1	2	1	2	6	Reject: Skin separating from fruit
5550	4	4	2	4	14	Reject: Flavour low and fruit a bit too large
6166	1	1	2	1	5	Reject
6432	4	5	4	5	18	Acceptable: Very good, best 2010/11
14228	2	2	4	2	10	Reject: Skin separating from fruit, centres disintegrating, good taste
15172	1	3	2	2	8	Reject
16222	3	4	4	4	15	Acceptable: Good, equal 3 rd best 2010/11
16340	4	2	4	4	14	Acceptable: Gets too large at times
16530	2	3	3	1	9	Reject: Mixed sizes
17871	3	3	2	3	12	Reject: Poor flavour
18389	2	3	3	2	10	Reject: Blistering skin
21648	1	1	2	1	5	Reject
23547	2	2	2	2	8	Reject
24992	3	3	4	1	11	Reject
25166	2	3	3	2	10	Reject: Skin separating from fruit
25223(a)	3	2	2	2	9	Reject: product too small
25223(b)	3	2	2	2	9	Reject: product slightly small
25223(c)	3	2	2	2	9	Reject: product slightly small
25226	2	3	1	1	7	Reject: Fibrous mouth feel
25689	4	3	4	3	14	Acceptable
25912(a)	2	2	1	3	8	Reject
25912(b)	2	1	2	1	6	Reject: Skin hard but centres are soft
26657	2	3	4	2	11	Reject: Good flavour
26779	2	2	1	3	8	Reject
27166	2	2	1	1	6	Reject: Not suitable for canning
29104	1	2	2	1	6	Reject: Fruit centres breaking up

Table 7 Continued: Assessment scores for the quality of canned fruit of apricot breeding line selections assessed in the 2010/11 season. Scores for individual attributes judged out of 5 (where 1-poor/soft, 3-good, 5-excellent/firm) and total is sum of the attribute scores (out of 20).

Selection	Assessment scores for characteristics of canned fruit					Comments
	Appearance	Colour	Flavour	Texture	Total	
29261	3	3	1	4	11	Reject: Small with bland flavour
31066	2	2	2	1	7	Reject
32228	2	1	1	2	6	Reject: Product too small and did not hold up after processing
32263	3	3	3	4	13	Acceptable
32460	3	3	2	2	10	Reject
32957	2	3	2	2	9	Reject: Tough skin separating from fruit
33996	1	1	1	1	4	Reject: Skin separating from fruit
35944	1	1	1	2	5	Reject

Year 7 – 2011/2012 season

During the 2011/12 season 20 apricot samples from the SARDI Apricot Breeding Program were selected and sent to SPC Ardmona (SPCA) at Shepparton for investigation of their canning potential. These lines represented 17 different genotypes. All lines were subjected to a pre-cooking analysis of size, flesh texture, colour and overall quality rating (Table 8). Lines were then canned in light syrup (20 °Brix) using a standard apricot cook in a rotary cooker (11 minutes at 100°C). After canning the lines were further assessed for appearance (overall, colour, blemish, blush), flavour and texture/firmness (Table 9).

Cropping of apricots in the 2011/12 season in the Riverland was generally light to moderate, in contrast to the previous season when crops were generally heavy. This resulted in a lower than normal number of lines being tested this season.

This season saw the identification of a new selection with excellent canned quality. Line 32255 assessed for the first time received a score of 17/20 based on its appearance, colour, flavour and texture which was the highest score achieved by a line this season. The 2010/11 season standout, selection 6432 (14/20) again showed potential, without being outstanding. Selection 16340 also scored very highly (16/20) when harvested at an early maturity with a more mature sample of this selection scoring 13/20.

Of other advanced lines with canning potential, selection 21131 performed well (12/20) with some issues of colour and mixed texture noted, likely due to mixed fruit maturities. Fruit softening in storage may also be an issue with fresh fruit of this line. Selection 4162 again demonstrated that it must be harvested at an early maturity for the processed product to have good flavour, scoring 11/20. If fruit is left to ripen to a similar maturity to other processing lines, selection 4162 has unacceptable flavour. This season it also showed some skin splitting in the canned samples. Selection 16222 (7/20) performed poorly this season with issues of size variation, flavour and texture likely due to a lighter crop producing excessive fruit size and variable fruit maturity. Given its previous good performances it will be retained.

“Bounty” (formerly selection 3444) is currently undergoing PBR registration and commercial release. Bounty continued to impress in an “off” crop season compounded by some poor pruning practices. Bounty carried a light crop but again produced a good quality canned product.

Following discussions with SPC Ardmona about the 2011/12 results it was decided that a second series of lines will be evaluated in the Shepparton district. This agronomic testing is to be conducted in the same manner as was used to confirm that “Bounty” is a suitable variety for production in the Shepparton district. SPC Ardmona was to select and engage a suitable grower on whose property the selections will be grown and assessed. Anticipated lines to be assessed are 4162, 6432, 16222, 16340, 21131 and 32255. Trees of 4162, 6432, 16222 and 16340 were propagated for planting in winter 2012. Unfortunately SPC were not in a position to accept the bare rooted trees in winter 2012 and they had to be destroyed. A further batch of trees is under propagation for planting in winter 2013. Trees of 21131 and 32255 will be propagated for planting in winter 2013 pending further favourable results.

Project CF09003 had at this time concluded its final contracted evaluation season. The breeder advised SPC that although SARDI is no longer providing research and evaluation services SPC should seek agreement direct with SARDI to progress outstanding issues.

Based on the 2011/12 results SPCA was advised that they should further evaluate fruit from newly identified selections 32255, 6432 and other promising evaluation selections in test canning in coming seasons via agreement with SARDI while its own trial trees are established.

Table 9: Assessment scores for the quality of canned fruit of apricot breeding line selections assessed in the 2011/12 season. Scores are average of 4 experienced assessors with individual attributes judged out of 5 (where 1-poor/soft, 3-good, 5-excellent/firm) and total is sum of the attribute scores (out of 20).

Selection	Assessment scores for characteristics of canned fruit					Comments
	Appearance	Colour	Flavour	Texture	Total	
3444	3	3	4	4	14	Acceptable: Large fruit and mixed texture
4162	3	3	2	3	11	Acceptable: Flavour down, some skin splitting
6432	4	4	2	4	14	Acceptable
7543	1	2	3	3	9	Reject: Blemished
10520	1	2	2	0	5	Reject
14228	2	2	2	2	8	Reject
16222	2	3	1	1	7	Reject: Variable size
16340(a)	4	4	4	4	16	Acceptable: Very good flavour
16340(b)	3	4	3	3	13	Acceptable: Some bruising
21131	3	2	4	3	12	Acceptable: Mixed texture
24992(a)	5	4	1	0	10	Reject
24992(b)	2	3	2	0	7	Reject
25689	3	2	3	4	12	Reject: Appearance not good, blemished and mixed maturity, lacks cropping
28177	0	1	1	0	2	Reject
31968	0	0	0	0	0	Reject: Plummy flavour
32160	0	1	1	0	2	Reject
32255	5	5	3	4	15	Acceptable: Looks outstanding
32263	0	0	0	2	2	Reject
35226(a)	2	3	0	0	5	Reject
35226(b)	2	3	2	4	11	Reject

Year 8 – 2012/2013 season

An extension was sought and obtained to delay the completion of HAL CF09003 until 30/4/13 to enable a further season of evaluation without additional cost to HAL and SPC Ardmona. During the 2012/13 season 6 apricot samples from the SARDI Apricot Breeding Program were selected and 5 sent to SPC Ardmona at Shepparton for investigation of their canning potential.

These 5 lines sent from Loxton represented 5 different genotypes including line 3444, “Bounty”. To these SPC Ardmona added a further two samples of “Bounty” from two separate Shepparton district trial growers, 3444(b) and 3444(c). All lines were subjected to a pre-cooking analysis of size, flesh texture, colour and overall quality rating (Table 10). Lines were then canned in light syrup (20 °Brix) using a standard apricot cook in a rotary cooker (11 minutes at 100°C). After canning the lines were further assessed for appearance (overall, colour, blemish, blush), flavour and texture/firmness (Table 11).

Cropping of apricots in the 2012/13 season in the Riverland was generally heavy in contrast to the previous season when crops were generally light to moderate. A lack of additional funding and resources resulted in a lower than normal number of lines being tested this season.

“Bounty” (formerly selection 3444) is currently undergoing PBR registration and commercial release. All “Bounty” lines, 3444(a)[origin Loxton Research Centre], 3444(b) and 3444(c)[origin Shepparton trail growers] performed well in canning trials with scores of 13/20, 15/20, 15/20 respectively. Sample 3444(a) from Loxton was slightly more mature and spent an extra 14 days in storage prior to canning than the Shepparton samples so a slightly lower result could be expected. These results highlight the robustness of this line and the difference in maturity times between the two districts 7/12/12 (Loxton) and 21/12/12(Shepparton).

Selection 32255 assessed for the first time in 2011/12, again produced excellent canned quality results receiving the seasons highest score of 16/20 based on its appearance, colour, flavour and texture.

The 2010/11 season standout, selection 6432 (18/20 in 2010/11) produced poor canning results (9/20 in 2012/13) from mixed quality fresh fruit and given its modest cropping levels and variable cropping pattern it will no longer be considered.

Selection 4162 again demonstrated that it must be harvested at an early maturity for the processed product to have good flavour, scoring 12/20. If fruit is left to ripen to a similar maturity that other lines are harvested for processing, selection 4162 has unacceptable flavour. Given its poor tolerance for over maturity, modest cropping levels and variable cropping pattern it will no longer be considered.

A sample of line 21131, a previously good performing line was picked but not sent to SPC Ardmona for canning. It was too soft and prone to bruising this season, traits that it had previously indicated may be problematic. This line was ultimately rejected and will no longer be considered.

Line 35095 performed poorly after canning (7/20) and will not be considered further.

Selection 16340 and 16222 were not evaluated this season which was a regrettable oversight as these remain to be fully evaluated and look quite exciting if picked at earlier maturity.

Following discussions with SPC Ardmona about the 2012/13 results it was decided that a series of lines will be planted for field evaluation in the Shepparton district. This agronomic testing is to be conducted in the same manner as was used to confirm that 'Bounty' is a suitable variety for production in the Shepparton district. SPC Ardmona is to select and engage a suitable grower on whose property the selections will be grown and assessed. Lines to be assessed are 16222, 16340 and 32255. Trees of these lines have been propagated for planting in winter 2013.

Table 11: Assessment scores for the quality of canned fruit of apricot breeding line selections assessed in the 2012/13 season. Scores are average of 4 experienced assessors with individual attributes judged out of 5 (where 1-poor/soft, 3-good, 5-excellent/firm) and total is sum of the attribute scores (out of 20).

Selection	Assessment scores for characteristics of canned fruit					Comments
	Appearance	Colour	Flavour	Texture	Total	
3444(a)	3	3	3	4	13	Acceptable-: Odd soft fruit
3444(b)	4	3	4	3	15	Acceptable: Slight green tinge on some, good flavour, held up well in processing
3444(c)	4	3	4	3	15	Acceptable: Slight green tinge on some, good flavour, held up well in processing
4162	3	3	2	4	12	Reject- Flavour let it down and too maturity dependant
6432	2	3	2	2	9	Reject
21131						Reject: Not canned fresh fruit was too soft and bruised
32255	4	4	4	4	16	Acceptable: looks and tastes good, held up well
35095	1	2	3	1	7	Reject: Too soft

Productivity and other performance characteristics relating to selections of interest

This project focussed on finding apricot selections within the program that produced acceptable canned quality that was comparable or superior to that of the current processing variety Trevatt. During selection some emphasis was also placed on other characteristics that are necessary for a processing apricot variety to be commercial, including factors such as cropping, ripening characteristics of fruit, freedom from defects. A number of selections that showed reasonable canning characteristics were rejected over the four year project for reasons other than the quality of the canned product, with many others not being submitted for testing in the first case. In this report data relating to characteristic other than canning performance are only presented on advanced selections that are of ongoing interest as processing varieties. These data are presented in Tables 12, 13, 14 and 15 for selections 3444, 16222, 16340 and 32255 respectively.

Table 12: Harvest date, crop load, fruit firmness, fruit size, total soluble solids measurements collected for Selection 3444 at Loxton, South Australia.

Tree	Harvest Date	Crop Load	Fruit			
			Weight (g)	Diameter (mm)	Total soluble solids (°Brix)	Firmness
Seedling	09/12/2004	Very Heavy	52	44	12	Fairly firm
	27/12/2003	Heavy	40	39	13	Fairly firm
	12/12/2002	Moderate Heavy	74	53	15	Softish
	11/12/2001	Moderate	80	50	16	Softish
	29/11/2000	Heavy	48	41	15	Fairly firm
	06/12/1999	Heavy	59	47	15	Fairly firm
	09/12/1998	Very Heavy	54	45	14	Softish
Grafted H29C	10/12/2012	Heavy	94	56	11	Fairly firm
	5/12/2011	Light Moderate	110	58	13	Firm
	31/12/2010	Very Heavy	45	43	15	Firm
	27/11/2009	Light	76	49	14	Firm
	19/12/2008	Very Heavy	56	46	15	Fairly firm
	10/12/2007	Heavy	87	53	14	Firm
	11/12/2006	Heavy	67	49	12	Firm
	12/12/2005	Very Heavy	62	51	13	Fairly firm
	07/12/2004	Heavy	71	46	15	Fairly firm
	23/12/2003	Heavy	54	45	14	Softish
	12/12/2002	Moderate	87	54	15	Softish

Seedling = original cross
H29C = grafted onto Myrobalan H29C plum stock

Table 13: Harvest date, crop load, fruit firmness, fruit size, total soluble solids measurements collected for Selection 16222 at Loxton, South Australia.

Tree	Harvest Date	Crop Load	Fruit			
			Weight (g)	Diameter (mm)	Total soluble solids (°Brix)	Firmness
Seedling	12/12/2012	Heavy	106	65	21	Firm
	16/12/2011	Moderate Heavy	118	67	14	Firm
	24/12/2010	Moderate Heavy	91	54	21	Firm
	7/12/2009	Light Moderate	59	52	19	Very Firm
	16/12/2008	Moderate Heavy	78	49	17	Fairly Firm
	06/12/2007	Moderate	75	51	17	Firm
	11/12/2006	Heavy	73	49	19	Firm
	09/12/2004	Very Heavy	62	47	17	Firm
	23/12/2003	Light	69	48	19	Firm
Grafted H29C	14/12/2012	Heavy	86	58	18	Firm
	13/12/2011	Moderate Heavy	113	62	17	Firm
	27/12/2010	Moderate Heavy	68	50	19	Firm
	9/12/2009	Moderate	80	52	20	Firm
	19/12/2008	Heavy	68	49	18	Firm

Seedling = original cross
H29C = grafted onto Myroblan H29C plum stock

Table 14: Harvest date, crop load, fruit firmness, fruit size, total soluble solids measurements collected for Selection 16340 at Loxton, South Australia.

Tree	Harvest Date	Crop Load	Fruit			
			Weight (g)	Diameter (mm)	Total soluble solids (°Brix)	Firmness
Seedling	10/12/2004	Heavy	64	47	14	Fairly firm
	31/12/2003	Heavy	83	51	14	Fairly firm
	26/12/2002	Moderate Heavy	64	48	20	Firm
Grafted H29C	14/12/2012	Moderate Heavy	103	62	20	Firm
	16/12/2011	Moderate Heavy	103	61	18	Firm
	24/12/2010	Moderate Heavy	88	56	19	Fairly firm
	01/12/2009	Heavy	66	50	16	Firm
	09/12/2008	Heavy	78	51	20	Firm
	06/12/2007	Moderate	98	56	20	Firm
	08/12/2006	Heavy	59	46	17	Firm
	15/12/2005	Very Heavy	72	50	17	Firm
	13/12/2004	Moderate Heavy	54	47	17	Fairly firm

Seedling = original cross
H29C = grafted onto Myrobalan H29C plum stock

Table 15: Harvest date, crop load, fruit firmness, fruit size, total soluble solids measurements collected for Selection 32255 at Loxton, South Australia.

Tree	Harvest Date	Crop Load	Fruit			
			Weight (g)	Diameter (mm)	Total soluble solids (°Brix)	Firmness
Seedling	30/11/2012	Heavy	44	44	18	Fairly firm
	02/12/2011	Moderate	45	42	21	Firm
	20/12/2010	Moderate	48	40	20	Fairly firm

Seedling = original cross

Table 18: List of selections that have been evaluated by canning in this project including summation of commercial potential as a processing variety

Selection	Year								Status at end of Project
	05/ 06	06/ 07	07/ 08	08/ 09	09/ 10	10/ 11	11/ 12	12/ 13	
3444	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Outstanding selection - Proceed commercial test orchard
4162		Blue	Blue	Blue	Blue	Blue	Blue	Red	Rejected- Too maturity dependant for quality with poor cropping patterns
4244					Red				Rejected - Canned fruit quality
5386					Red				Rejected - Canned fruit quality
5550					Blue	Red			Rejected - Canned fruit quality just ok and fresh fruit traits only just passable
6166						Red			Rejected - Canned fruit quality
6432						Blue	Blue	Red	Rejected - Canned fruit quality (Inconsistent) with poor cropping patterns
7543					Red		Red		Rejected - Canned fruit quality, fruit rain damages, often too blemished and blushed
10520		Red					Red		Rejected - Canned fruit quality
13971					Red				Rejected - Canned fruit quality
14228						Red	Red		Rejected - Canned fruit quality
15172						Red			Rejected - Canned fruit quality
15530					Red				Rejected - Canned fruit quality
16222		Blue	Blue	Red	Blue	Blue	Red		Shown commercial potential -Proceed to commercial test orchard
16340		Blue	Blue	Red	Blue	Blue	Blue		Shown commercial potential -Proceed to commercial test orchard
16530						Red			Rejected - Canned fruit quality
17513			Red		Red				Rejected - Canned fruit quality
17871						Red			Rejected - Canned fruit quality
18389						Red			Rejected - Canned fruit quality
21131							Blue	Red	Rejected - Canned fruit quality (Inconsistent), fruit softens and bruises a lot
21648						Red			Rejected - Canned fruit quality
21661				Blue	Red				Rejected - Inconsistent canned fruit quality
23547						Red			Rejected - Canned fruit quality
24992						Red	Red		Rejected - Canned fruit quality
25166						Red			Rejected - Canned fruit quality
25223					Blue	Red			Rejected - Inconsistent canned fruit quality
25226						Red			Rejected - Canned fruit quality
25689					Blue	Blue	Red		Rejected - Canned fruit quality (Inconsistent) with poor cropping patterns
25912					Red	Red			Rejected - Canned fruit quality
26657						Red			Rejected - Canned fruit quality but had good flavour
26779						Red			Rejected - Canned fruit quality
27166						Red			Rejected - Canned fruit quality
27227					Red				Rejected - Canned fruit quality
28177							Red		Rejected - Canned fruit quality
29104						Red			Rejected - Canned fruit quality
29261						Red			Rejected - Canned fruit quality
31066					Red	Red			Rejected - Canned fruit quality
31968							Red		Rejected - Canned fruit quality

Table 18 Continued: List of selections that have been evaluated by canning in this project including summation of commercial potential as a processing variety

Selection	Year								Status at end of Project
	05/ 06	06/ 07	07/ 08	08/ 09	09/ 10	10/ 11	11/ 12	12/ 13	
32160									Rejected - Canned fruit quality
32228									Rejected - Canned fruit quality
32255									Outstanding selection - Proceed commercial test orchard
32263									Rejected - Canned fruit quality (Inconsistent)
32460									Rejected - Canned fruit quality
32957									Rejected - Canned fruit quality
33996									Rejected - Canned fruit quality
35095									Rejected - Canned fruit quality
35226									Rejected - Canned fruit quality
35944									Rejected - Canned fruit quality

	Quality of canned fruit was marginal or lacking
	Quality of canned fruit was acceptable or above

Discussion

In this project a total of 48 selections from the apricot breeding program were evaluated for their commercial potential as a processing variety (assessed as a canned product). These selections were identified through annual screening of crosses as they commence cropping in the primary evaluation blocks of the apricot breeding program based at Loxton along with selections previously identified within the program and maintained in secondary evaluation blocks. In excess of 39,000 crosses have been produced and screened over the life of the breeding program. During this project “Bounty” (selection 3444) has proceeded by commercial agreement into large scale commercial trials with SPC Ardmona as commercial partner. Details of this commercial arrangement are not the subject of this identification and evaluation project and are dealt with separately by SARDI and HAL as part of wider and ongoing commercialisation and IP arrangements. PBR DUS trials for “Bounty” are in progress at Loxton Research Centre and PBR Part 1 registration has been obtained.

Another highly promising line (selection 32255) is worthy of fast tracking into larger scale commercial production trials on the basis of two outstanding canning performances over the past two seasons. A further two lines, selections 16222 & 16340, are worthy of ongoing consideration and further evaluation. These lines are both heavy cropping and large fruited. Their future is dependant on the market opportunity for larger sized fruit in a processed product. However there is little doubt that they are both capable of producing excellent flavoured canned products. These outputs and outcomes are in line with the expectations of the project. It is now important that both “Bounty” and selection 32255 continue to be progressed along the commercialisation pathway.

SPC Ardmona is in the process of arranging small scale trial evaluation plantings of these selections. Trees have been grafted to develop the plantings and will be ready to be sent to trial growers in winter 2013. Early feedback on young trees and fruit being produced of “Bounty” grown in Shepparton is supporting the good results achieved from the trees growing at the Loxton Research Centre. Early fruiting has been achieved with the fruit being clean and producing good quality canning results (Table 11). SPC Ardmona is also in the process of arranging budwood source blocks to support the nursery production of trees.

Line 4162 looked to be a very promising candidate from the previous project (HAL FR05010) and for a large proportion of this project. However, over time it has demonstrated that it must be harvested at an early maturity for the processed product to have good flavour. If fruit is left to ripen to a similar maturity to other processing lines, selection 4162 has unacceptable flavour. This lack of robustness and inconsistency for quality outcomes and a slightly low, erratic cropping habit have ultimately led to its rejection.

A review of the remaining untested material still residing in the breeding program that may have applications for processing reveals a number of interesting candidates. If possible, SPC Ardmona should arrange to evaluate the following selections 24086, 30854, 37205, 37331, 37331, 37551 and 37752 to complete screening for processing potential from the breeding program.

Technology transfer

This project is primarily focussed on identifying new apricot varieties to be utilised in the Australian processing sector that will improve the reliability of supply of suitable quality apricots to SPC Ardmona. As such, technology transfer activities in this project have focussed on maintaining a good level of communication and exchange of project findings between project staff and representatives of SPC Ardmona.

Communication has also occurred between project staff and the growers nominated by SPC Ardmona to which evaluation trees have been supplied in the Shepparton district.

Information of a general nature has been published each year about the project in the HAL Canned Fruit Annual Industry Report.

Following the 2009/10 season, SPC Ardmona indicated that they wished to proceed with the establishment of commercial scale test plantings of “Bounty” in the Shepparton district. Under the initial terms agreed with SPC Ardmona, trees as part of the initial planting (10,000 trees) were assigned to selected growers from a group of approximately 20 who responded to expressions of interest. All individual blocks planted will be of a commercially viable size.

Following the 2010/11 season it was agreed that “Bounty” should proceed to commercialisation. Agreement has been reached between SPC Ardmona, HAL and SARDI that involves the structured release of trees to growers managed by SPC Ardmona. The basic structure of the agreement delivers both a tree and end point production royalty to stakeholders.

A grower information sheet has been produced for “Bounty”. Prior to publication the sheet was reviewed by SPC Ardmona. This publication has been utilised in grower communications by SPC Ardmona in relation to the commercial release of “Bounty”. A copy of the grower information sheet was appended to Milestone 104 of this project.

4. COMMERCIALISATION AND/OR INTELLECTUAL PROPERTY ISSUES

“Bounty” has been granted provisional PBR registration as full registration continues to be sought.

SARDI have a commercialisation agreement with SPC Ardmona for exclusive use of the variety “Bounty” within Australia. The details of this agreement were communicated to and approved by HAL. This agreement was based on an agreed controlled initial planting and applies both tree and production royalty systems.

Under the terms agreed with SPC Ardmona, trees as part of the initial planting, 10,000 trees were to be assigned to growers who responded to an expression of interest. All individual blocks planted were to be of a commercially viable size. Subsequent planting will be made open to all SPC Ardmona apricot growers.

Initial plantings of 2,300 trees in total were made by six growers in 2011. A further 2,478 trees were planted by seven growers in 2012. Further plantings will be made in coming seasons. Difficulties were experienced in sourcing the required number of rootstocks to reach to initial agreed planting levels. SPC Ardmona are responsible for ensuring that prior to tree delivery all growers to which trees are supplied sign a non propagation agreement provided by SARDI. SPC Ardmona will also manage tree propagation and distribution as well as royalty collection systems.

In relation to other canning selections, SARDI is facilitating trialling by supplying budwood and grafted trees under non-propagation and testing agreements to protect intellectual property. Any varieties that proceed to commercial use will be protected by Plant Breeders Rights as appropriate.

Recommendations

Based on the results achieved to date it would be prudent to extend the current work through the establishment of a new project with SPC Ardmona and to progress each selection as follows:

“Bounty” (Selection 3444)

- Continue both agronomical and canned product evaluation of trees growing in the Shepparton district.
- Continue commercial release program

Selection 32255

- Continue evaluation, initially on fruit from the Loxton Research Centre.
- Facilitate the planting of evaluation trees in the Shepparton district.
- Fast track as far as possible the commercial release of this line
- Establish test plantings of sufficient size in the Shepparton district to enable commercial quantities of fruit to be canned at the SPC Ardmona processing plant and test marketed.
- Establish commercial agreements with SPC Ardmona to facilitate release should the variety prove commercial.
- Develop production information package for growers to accompany release.

Selections 16222 and 16340

- Investigate what opportunities exist or could be developed for larger sized processed apricot products.
- Continue evaluation on fruit from the Loxton Research Centre and the already established evaluation trees in the Shepparton district.
- Decide if these selections warrant progressing to the next stage of commercialisation.

The SARDI Apricot Breeding Program still has the potential to supply a limited number of promising new canning style lines for evaluation next season to complete the screening of currently planted genetic material at Loxton Research Centre. To ensure all the potential from the breeding program is realized SPC Ardmona should arrange to complete this screening.

References

Nil.