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Oaten Hay Variety Development

Improved Oat Varieties for Hay Production

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by P.K. Zwer and S.D. Hoppo

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Foreword

Australian hay/straw exports have increased from 223,000 tonnes in 1997/98 to 393,000 tonnes in 1999/2000 (Mackie, 2000). In order to meet the new challenges in the domestic and export market for quality and quantity assurance, oat varieties need to be developed specifically for hay production.

The project aims were to improve oat varieties for hay end-use characters prioritised by farmers and hay processors by 2000. The new project focused on generating new populations and promoting advanced breeding lines currently in the program for oaten hay end-use.

This is the final report for the research project titled 'Development of Disease Resistant, High Yielding Oat Cultivars with Enhanced Quality for Hay Production' in established rural industries, sub-program, fodder crop research.

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This report is an addition to RIRDC's diverse range of over 800 research publications, forms part of our Fodder Crops R&D program, which aims to facilitate the development of a sustainable and profitable Australian fodder industry.

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Simon Hearn
Managing Director
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Executive Summary

- Approximately 60 germplasm introductions were sourced from oat breeding programs and collections worldwide for oat hay variety development.
- A total of 160 single crosses were made in the three year project.
- Approximately 900 F_4 plots were sown from breeding lines derived from 1997 single crosses. Additional early generation material is in the F_2 and F_3.
- Stage 4 hay trials consisting of 32 entries were sown at three to four locations in 1998, 1999, and 2000.
- Stage 5 hay trials consisting of 12 entries, a subset of the stage 4 trial entries, were sown at 11 sites in 1998, eight sites in 1999, and seven sites in 2000.
- Agronomic data, disease reactions, and quality evaluations were used to promote the most promising lines to the next year.
- Two advanced breeding lines, SV88083-4 and SV87103-109, were selected as new variety releases.
- Commercialisation of SV88083-4 is proceeding.
- SV93072-43 is being considered for variety release.

Introduction

Oaten hay exports to Japan have increased from about 170,000 tonnes in 1997 to almost 400,000 tonnes in 1999. The industry was worth about $110 million in 1999 (delivered to Japan) and with the expansion of the market to 500,000 tonnes would be worth about $183 million for Australia. Currently about 148,000 tonnes of hay is exported from South Australia, making the industry worth about $56.8 million to this state. Proportional increases in the amount of hay exported in the next few years would result in an additional $33 million for the state. The market expansion is dependent on supplying first grade palatable hay.

Benefits from the release of improved oat hay varieties will influence growers, processors, and the customer. Higher dry matter production, improved disease resistance, and enhanced quality will help to reduce the risk of producing first grade oaten hay and ensure the highest economic return. The availability of first grade hay with consistent palatability will provide a reliable supply of a quality product for processors to market domestically and overseas. Customers will benefit with a superior performing fodder.

Growers have the opportunity to increase gross margins by increased production of first grade quality hay with improved varieties. Increased dry matter production in a first grade export quality hay variety of .5 tonne per hectare would result in an additional $55 to $75 per hectare for the grower. First grade export quality hay is priced at $110 to $150 per tonne, whereas low grade export hay is about $70. A new variety with improved quality could result in an additional $40 to $80 per tonne for first grade hay compared to low quality export hay.

The continued growth of this industry is dependent on meeting specifications of more discriminating export and domestic markets. Oat varieties with improved characters for fodder performance are needed by both growers and hay processors. This research program was designed to specifically improve oats for hay end-use.

Objectives

- Generate new oat populations and identify selections with improved hay end-use characters based on breeding priorities identified by farmers and hay processors by 2000.
- Promote F_5 and F_6 oat lines currently in the program to advanced trials.
- Review the most promising advanced breeding lines for variety releases.

Methodology

Germplasm and Crossing

Parental material was selected for improving characters prioritised by farmers and hay processors. Agronomic characters such as increased dry matter yield, improved early vigour to compete with weeds, thin to medium stem diameter, plant colour, and a wider range of plant maturites were evaluated in germplasm. Adapted lines and introduced germplasm were assessed for resistance and tolerance to cereal cyst nematode (CCN) and stem nematode as well as resistance to stem rust, leaf rust, and barley yellow dwarf virus (BYDV). Forage quality characters such as digestibility, water soluble carbohydrates, and shear energy were also identified as important criteria for parental material. Crosses were made with introduced germplasm possessing desirable traits and adapted oat lines developed in the SARDI breeding program. F_2 progenies were visually evaluated in the field and panicles were selected.

Advanced Breeding Lines

Table 1 shows the stage 4 trial locations in South Australia and Victoria where hay yield, agronomic characters, and disease reactions were assessed for advanced breeding lines and varieties in 1998, 1999, and 2000. The stage 4 trials consist of 32 entries representing varieties and advanced breeding lines. The Oat Breeding Program conducted trials at seven locations in 1998, seven locations in 1999, and four locations in 2000. Cereal cyst nematode tolerance reactions were evaluated at Blyth Melton, and Minnipa in 1998, Kadina, Melton, and Minnipa in 1999, and Paskeville and Hoyleton in 2000. Stem nematode tolerance reactions were assessed at Freeling in 1998, Maitland in 1999, and in a terrace experiment sown at the Waite in 2000. Other sites were sown by cooperators in the SARDI Field Crop Evaluation Program and Agriculture Victoria. Resistance reactions for CCN and stem nematode were assessed by the SARDI Field Crop Pathology Nematode Group. Stem rust, leaf rust, BYDV, septoria, red leather leaf, and bacterial blight were assessed in the field experiments by the Oat Breeding Group when natural infections occurred. Seedling and adult plant reactions for stem and leaf rust were assessed by the National Cereal Rust Laboratory, the University of Sydney.

Table 1. Stage 4 trials sown to evaluate hay yield (Yld), cereal cyst nematode (CCN) and stem nematode (SN) tolerance reactions, and hay quality (Q) in 1998, 1999, and 2000.

Location	1998				1999				2000			
	Yld	CCN	SN	Q	Yld	CCN	SN	Q	Yld	CCN	SN	Q
SA												
Birdwood	√			√	√			√	√			√
Kingsford	√			√	√			√	√			√
Pinery	√			√	√			√	√			√
Freeling			√									
Hoyleton										√		
Maitland							√					
Melton		√				√						
Minnipa		√				√						
VIC												
Horsham	√			√	√							

Table 2 shows the stage 5 trial locations sown in 1998, 1999, and 2000. The trial consists of 12 to 14 of the most advanced breeding lines and currently grown varieties. All trial locations except Cooke Plains and the CCN site are conducted by agronomists in the SARDI Field Crop Evaluation Group and Agriculture Victoria.

Table 2. Stage 5 trials sown to evaluate hay yield (Yld), cereal cyst nematode (CCN) tolerance reactions, and hay quality (Q) in 1998, 1999, and 2000.

Location	1998			1999			2000		
	Yld	CCN	Q	Yld	CCN	Q	Yld	CCN	Q
South Australia									
Cooke Plains	√		√	√		√			
Greenpatch	√		√	√		√	√		√
Kybybolite	√		√	√		√	√		
Loxton	√						√		√
Minnipa	√		√				√		√
Waikerie	√			√		√	√		√
Blyth		√							
Kadina					√				
Paskeville								√	
Victoria									
St. Arnaud	√		√	√			√		√
Lake Bolac	√		√	√		√			
Rutherglen	√		√	√		√	√		√
Walpeup	√		√	√		√			
Kooreh									
Streatham	√		√						

Dry matter production was measured by two sampling methods. The entire 5 m plot was cut using a forage harvestor for each of the three replications at Pinery and Kingsford, weighed, and a subsample taken. A 1 m^2 quadrant was cut from three replications at the other locations, weighed, and a subsample taken. The subsamples were oven dried at 60 to 65 °C and weighed. Hay yield was calculated by dry weight g./wet weight g. = percent moisture. Total wet weight g. was multiplied by percent moisture and converted to kilograms per hectare by conversion factors calculated for a 1 m^2 quadrant and a 5m x 1.3m plot.

After determining dry matter production the subsamples from the three replications were further subsampled, composited, and sent for hay quality characterisation. Hay quality samples from 1998 were analysed by FEEDTEST for crude protein, digestibility, and metabolisable energy. The 1999 and 2000 hay quality samples were ground and analysed by CSIRO Animal Production Centre, Perth.

The hay quality characters measured were crude protein, digestibility, water soluble carbohydrate, shear energy, acid detergent fibre, and neutral detergent fibre.

Data summaries were prepared each year outlining advanced breeding lines' hay and grain yield, hay and grain quality, disease reactions, and agronomic characters such as early vigour, stem diameter, colour, and lodging. Promising lines were promoted through the system and maintained in the stage 4 and stage 5 hay trials. Long term data summaries for advanced breeding lines were compared to varieties currently available. Advanced breeding lines with superior performance were considered for variety release by the Oaten Hay Industry Advisory Committee.

Detailed Results and Discussion

Germplasm and Crossing

Parental germplasm was sourced from oat breeding programs and collections worldwide. Table 3 shows the name or identification number of the germplasm and the source origin. The germplasm was assessed for characteristics desired for hay improvement and selected for use in the crossing program. There were 48 crosses made in late1997 using 19 lines selected for hay variety improvement. The crosses were made in late 1997 anticipating the start of the RIRDC funded project in January 1998. An additional 53 crosses were made in 1998 with 28 germplasm introductions and 59 crosses were made in 1999 with 16 different introductions. A total of 160 single crosses were made using 63 introduced lines during this project. Many of the single crosses required an additional cross to an adapted line, producing a three way cross. A three way cross requires two crossing cycles to produce the F_1 seed for field selection.

Lines obtained from the Iowa State Oat Breeding Program, USA were obtained for high grain oil content. Advanced breeding lines from the North Dakota State Breeding Program, USA were sourced for stem and leaf rust resistance, leafiness, and late maturity. The Quaker Oat International Oat Nursery is a cooperative research nursery between the University of Minnesota, the University of Florida, Texas A&M University, Federal University of Rio Grande do Sul, Brazil, The Quaker Oats Company, and the United States Department of Agriculture-Agricultural Research Service, Aberdeen, Idaho. New lines are submitted from each of the cooperators annually and funding is provided by the Quaker Oats Company. Nurseries are grown worldwide and data compiled for each entry. The Quaker International Oat Nursery is acquired by the National Cereal Rust Laboratory, the University of Sydney and put through quarantine. Lines are evaluated for stem and leaf rust resistance by the National Cereal Rust Evaluation Program, funded by GRDC. Breeding lines are sent to Australian Oat Breeding Programs as requested. The lines sourced from this nursery were used to introduce improved disease resistance for stem and leaf rust, CCN, stem nematode, bacterial blight, septoria, and barley yellow dwarf virus. The breeding lines from Saskatoon, Canada were used to introduce variation for leaf width and colour, late maturity, and quality. Two lines were sourced from Japan for early vigour and stem diameter. The Brazilian germplasm was used to introduce improved disease resistance and quality. The germplasm obtained from Winnipeg, Canada, Minnesota, USA, France and miscellaneous sources were used to introduce variation for plant type, maturity, and disease resistance.

Although most of the single crosses produced in late 1997 required an additional cross in 1998, F_2 seed of a few single crosses was sown in 1998 plots and panicles selected. F_3 panicles were sown in 1999 headhills and the most promising were selected for F_4 unreplicated trials sown in 2000. Approximately 900 F4 plots were sown from lines derived from 1997 single crosses. Lines from crosses made in 1998 and 1999 followed the same time line as the 1997 material.

Table 3. The name/ID and the origin of germplasm selected and used in the 1997, 1998, and 1999 crossing blocks and the number of successful crosses for hay variety improvement.

	1997	1998	1999
Number of successful crosses	48	53	59
State and Country of Origin	Introduced line	Introduced line	Introduced line
Iowa, USA	IA91098 IAN944-1	IA91387-2 IA91055-1 IAH611-447 IA91422-2	
North Dakota, USA	ND880107 ND900257 ND9308424 ND9308572 ND931202 ND931248	ND873126	
Quaker International Oat Nursery, USA	Q89-86 Q91-194 Q92-119 Q93-53 Q93-86 Q93-114	Q89-128 Q92-105 Q93-78 Q93-116	Carma Q94-119 Q94-158
Saskatoon, Canada	7ZOP95 8ZOP95 12ZOP95 13ZOP95	SO93086 1ZOP95 2ZOP95 3ZOP95 4ZOP95 5ZOP95 9ZOP95 10ZOP95 14ZOP95	SO93763
Japan		AK-1 AK-5	
Brazil		UFRGS 17 UFRGS 921198 UFRGS 940263-3 UFRGS 940787 UFRGS 940787-1	UFRGS 911740 UFRGS 921173 UFRGS 93519 UFRGS 940556-3
Winnipeg, Canada			W93069
Minnesota, USA		Minhafer	Marion
France	Grised'hiver		
Other			Q0248-49 Q0239-7 Q0248-23 Marion Shaw Lamar

Advanced Breeding Lines

The 2000 stage 4 and 5 hay evaluation trials represented the most elite advanced breeding lines promoted during this three year project. Hence data will be presented from 2000 for the most promising advanced breeding lines for hay production. Table 4 shows the 12 stage 5 entries with their yield, disease reactions, quality, agronomic characters, and pedigrees. Entries in tables 4 and 5 represent the 32 entries in the stage 4 hay trial. The entries have combinations of improved disease resistance for CCN, stem and leaf rust, stem nematode, BYDV, and septoria.

Hay yields are shown in Tables 6 and 7 for entries in the 2000 stage 5 hay trials. SV88083-4 yielded similar to or better than Marloo at all locations. Its best performance was at Minnipa where it was 18% higher yielding than Marloo. SV88083-4 also outyielded Marloo by between 5 and 17% at Kybybolite, Waikerie, Greenpatch, Rutherglen and Turretfield. This line will be commercialised in 2001 with limited seed being available to growers in 2002. It combines high dry matter production with resistance to CCN and moderate tolerance to both CCN and stem nematode. SV93072-43 also yielded similar to or better than Marloo at all locations. Its best performance was at Minnipa where it out yielded Marloo by 27%. It was also 11 to 12% higher yielding than Marloo at Waikerie, Greenpatch, Kybybolite and Turretfield. This line combines high dry matter production with better stem rust resistance (rated as moderately susceptible compared to susceptible) and leaf rust resistance (rated as resistant compared to susceptible) than Marloo, Swan and Wallaroo. This level of stem rust resistance was enough to reduce disease development on SV93072-43 at sites with high inoculum levels such as Kybybolite, Francis and Turretfield in 2000. It is also resistant to CCN and moderately tolerant to stem nematode. SV93072-43 is currently being multiplied for potential release in 2004. SV87103-109 is not quite as high yielding compared to SV88083-4 and SV93072-43 but performed similar or better than Marloo at seven locations. SV87103-109 performed best at Minnipa, Waikerie, Kybybolite, Rutherglen and Turretfield where it out yielded Marloo by 5 to 10%. This line continues to have better hay digestibility than current varieties combined with high dry matter production, and resistance to CCN and leaf rust. It is currently being multiplied for potential release in 2003. Decisions about other potential variety releases will be reviewed once all data is analysed and summarised.

Grain yields are shown in Tables 8 and 9 for entries in the 2000 stage 5 hay trials. SV88083-4 was similar to Marloo in grain production. Although not statistically different, the other five entries ranged from 10 to 23% higher yielding than Marloo when averaged over eight sites. The entries trialed for one or two years have improved grain yield compared to the current varieties.

The 12 entries in the stage 5 hay trial are a subset of the entries in the stage 4 hay trial. Table 10 shows the hay yield and percent of Marloo for 32 entries in the 2000 stage 4 hay trial sown at three sites in South Australia. The current varieties, Bettong, Marloo, Swan, Wallaroo, Glider, and Eurabbie, were included as check varieties for comparison of yield, disease resistance, and quality characters. There were 17 advanced breeding lines evaluated in the trial. Two entries were submitted by Pacific Seeds for evaluation, TAMO397, and Warrego. Interstate advanced breeding lines from public breeding programs are also included in the stage 4 hay trial. However, no interstate advanced breeding lines were submitted to us in 2000.

SV88083-4, SV95073-17 and SV91169-110 had the highest mean dry matter production in the trial. SV95073-17 and SV91169-110 produced significantly more hay than Marloo at Turretfield in 2000. Four lines, SV93072-43, SV95073-13, SV95073-44, and SV95077-4, were the next highest hay yielding lines in the trial when averaged over the three sites. The nine lines selected from the crosses 95017 and 95018 were promoted into the trial based on disease resistance. They were resistant to stem and leaf rust. However, the lines were lodging susceptible and not acceptable for further evaluation. The most promising of this group were selected for the crossing block to improve their lodging resistance.

Table 4. Hay yield, agronomic characters, disease reactions, hay quality, and pedigrees for 12 stage 4 and stage 5 entries grown in 2000.

Variety/Line	Ht	Matur-ity	Hay yield as % Marloo	End-use	Disease								Hay quality							Years in S4 trial	Pedigree
					CCN		SR	CR	BYDV	Bac	SN	Sep	Digesti-bility	Crude protein	NDF	ADF	Shear energy	Stem diam	Early vigour		
					Res	Tol															
Bettong	MT	M	103	Hay/grain	R	I	MS	R	MR	MR	T	MS-MR	M	M	MH	MH	MH	4.9	7	7	Complex
Marloo	T	M	100	Hay/grain	R	MT	S	S	MS	VS	MI	S	M	M	M	M	M	6.2	3	7	
Swan	T	M	103	Hay/grain	MR	I	S	S	MR	MS	I	MS	M	ML	M	M	M	6.0	2	7	
Wallaroo	T	E	101	Hay/grain	R	MT	S	S	MS	MS	MI	S	M	M	M	M	M	6.3	3	7	
Glider	T	L	113	Hay	MS	I	R	R	S	R	MT	MR	M	ML	ML	ML	M	5.9	8	6	Complex
Eurabbie	D	ML	107	Graze/ grain	MS	MI	S	S	MS	S	MI	-	MH	MH	L	L	ML	6.2	7	3	
SV87103-109	T	M	104	Hay	R	MI	MS	R	MS	-	I	MS-MR	MH	M	M	M	M	6.0	3	5	Dumont/Wallaroo//Bandicoot
SV88083-4	T	M	110	Hay	R	MT	S	S	MR	-	MT	MS-MR	M	M	ML	M	M	6.4	4	4	MIOLRP-86-3/ Echidna//Wallaroo
SV93033-21	T	M	109	Hay	R	MT	S	R	MR	R	MT	S	M	M	M	M	M	6.3	4	2	OX84;228-21-30/Q-84-135
SV93072-43	MT	M	101	Hay	R	MI	MS	R	MR	-	MT	-	M	MH	MH	MH	MH	6.1	3	2	Potoroo/Q-85-183//Carrolup
SV95073-17	MT	M	100	Hay	MR	MT	MR	R	MR	-	MI	MS	M	ML	M	M	M	5.5	5	1	OX89;153-122/Euro
SV93101-1-22	T	M	102	Hay	R	MT	MR	R	MR	-	MI	MR	M	M	ML	M	M	7.0	3	1	Euro/OX87;032-5

Key: CCN = Cereal Cyst Nematode, SN = Stem Nematode, SR = Stem Rust, LR = Leaf (crown) Rust, BYDV = Barley Yellow Dwarf Virus, Bac = bacterial blight, Sep = septoria, Stem diam = stem diameter (mm)

I = intolerant, MI = moderately intolerant, T = tolerant, MT = moderately tolerant, R = resistant, S = susceptible, seg = segregating #Sydney Uni rust score

Table 5. Hay yield, agronomic characters, disease reactions, hay quality, and pedigrees for the additional 20 entries in the stage 4 hay trials.

Variety/Line	Ht	Matur-ity	Yield as % Marl.	End-use	Disease								Hay quality							Years in S3 trial	Pedigree
					CCN		SR	CR	BYDV	Bac	SN	Sep	Digesti-bility	Crude protein	NDF	ADF	Shear energy	Stem diam	Early vigour		
					Res	Tol															
Echidna	D	EM	95	Hay/grain	S	I	S	S	MS	S	MT	S	MH	MH	ML	ML	M	5.7	3	7	
SV91169-110	T	M	107	Hay	R	MT	S	MS	MR	-	MT	-	M	M	MH	MH	M	6.7	3	3	OX84;083-2-4/Euro
SV93074-27	ST	M	101	Hay/grain	R	MT	S	MR	R	-	T	MR	M	MH	M	M	M	6.0	2	2	WA84Q405/88123-9// 86153-101
SV93127-12	MT	EM	96	Hay/grain	R	MT	S	MS	MR	-	T	MR	M	M	M	M	M	6.9	3	2	PALLINUP/OX86;153-101
SV94043-9	ST	ML	-	Hay	S	MT	MR	S	MR	-	MT	MR	-	-	-	-	-	-	1	1	88;123-101/87;0786// WA84Q405
SV95017-103	T	M	-	Hay	S	I	MR	R	R	-	I	R	-	-	-	-	-	-	4	1	UFRGS884073/OX89;170-17
SV95017-119	MT	M	-	Hay	MS	I	MR	R	R	-	I	MS	-	-	-	-	-	-	5	1	UFRGS884073/OX89;170-17
SV95017-179	T	EM	-	Hay	S	I	MR	R	R	-	I	R	-	-	-	-	-	-	6	1	UFRGS884073/OX89;170-17
SV95018-20	MT	EM	-	Hay	R	I	R	R	MR	-	I	MS	-	-	-	-	-	-	5	1	UFRGS881969/OX89;170-17
SV95018-4	T	EM	-	Hay	MR	I	MR	R	MR	-	I	R	-	-	-	-	-	-	5	1	UFRGS881969/OX89;170-17
SV95018-41	T	EM	-	Hay	R	I	MR	R	MS	-	I	R	-	-	-	-	-	-	5	1	UFRGS881969/OX89;170-17
SV95018-73	T	E	-	Hay/grain	R	I	MR	R	MR	-	I	MR	-	-	-	-	-	-	4	1	UFRGS881969/OX89;170-17
SV95018-78	T	EM	-	Hay	R	I	MR	R	MS	-	I	S	-	-	-	-	-	-	7	1	UFRGS881969/OX89;170-17
SV95018-98	MT	EM	-	Hay	R	I	R	R	MR	-	I	MR	-	-	-	-	-	-	2	1	UFRGS881969/OX89;170-17
SV95073-13	T	M	-	Hay	MR	MT	MR	R	MS	-	MI	MR	-	-	-	-	-	-	4	1	OX89;153-122/EURO
SV95073-44	MT	M	-	Hay/grain	R	MT	MR	R	MR	-	MT	MR	-	-	-	-	-	-	5	1	OX89;153-122/EURO
SV95076-16	T	E	-	Hay	R	MT	MS	R	MR	-	MI	MS	-	-	-	-	-	-	5	1	OX90;002-4/OX89;019-137
SV95077-4	T	L	-	Hay	R	I	R	R	MS	-	I	R	-	-	-	-	-	-	4	1	ND9308572/EURO
PACSEEDS 1	T	M	99	Grazing	S	I	MR	R	MR	-	I	-	M	MH	M	MH	M	5.2	8	2	PO548
WARREGO	T	L	104	Grazing	S	I	R	R	-	-	I	-	M	M	-	-	-	6.2	4	2	PO535 (previously tested in 1998)

Key: CCN = Cereal Cyst Nematode, SN = Stem Nematode, SR = Stem Rust, LR = Leaf (crown) Rust, BYDV = Barley Yellow Dwarf Virus, Bac = bacterial blight, Sep = septoria, NDF=neutral detergent fibre

ADF=acid detergent fibre, Stem diam=stem diameter (mm), Early vigour is 1-9 where 1=fast, 9=slow

I = intolerant, MI = moderately intolerant, T = tolerant, MT = moderately tolerant, R = resistant, S = susceptible, seg = segregating

Table 6. Hay yield (kg/ha) for the 2000 stage 5 hay trials grown at five locations in South Australia and two locations in Victoria .

Variety/Line	Waikerie	Loxton	Minnipa	Greenpatch	Kybybolite	Rutherglen	St. Arnaud	Mean	Mean % Marloo
Bettong	6575	2995	4012	11231	10996	14214	12811	8976	98
Marloo	6809	3077	3491	11991	11826	14277	12580	9150	100
Swan	6769	3059	3712	12245	11710	14855	12782	9305	102
Wallaroo	6763	3122	4344	12822	11740	14514	12356	9380	103
Glider	5977	2951	3885	12626	13273	14537	12385	9376	102
Eurabbie	6391	2957	3627	12242	11123	13995	12711	9007	98
SV87103-109	7308	2989	3841	11717	12770	15133	12365	9446	103
SV88083-4	7233	3068	4103	14025	12378	14956	12285	9721	106
SV93033-21	7226	2943	3852	14024	11848	14648	12332	9553	104
SV93072-43	7551	3070	4442	13298	13222	14530	12296	9773	107
SV95073-17	6381	3079	4011	13354	12145	14622	12270	9409	103
SV93101-1-22	6627	3026	4053	13871	10732	14332	12331	9282	101
Site Mean	6801	3028	3948	12787	11980	14551	12459		
Coeff. Variation (%)	8.0	23.5	9.4	8.3	27.4	8.2	13.3		
LSD (0.05)	1410	390	870	3100	3870	1443	NSD		

Table 7. Hay yield as a percent of the site mean for the 2000 stage 5 hay trials grown at five locations in South Australia and two locations in Victoria.

Variety/Line	Waikerie	Loxton	Minnipa	Greenpatch	Kybybolite	Rutherglen	St. Arnaud
Bettong	97	99	102	88	92	98	103
Marloo	100	102	88	94	99	98	101
Swan	100	101	94	96	98	102	103
Wallaroo	99	103	110	100	98	100	99
Glider	88	97	98	99	111	100	99
Eurabbie	94	98	92	96	93	96	102
SV87103-109	107	99	97	92	107	104	99
SV88083-4	106	101	104	110	103	103	99
SV93033-21	106	97	98	110	99	101	99
SV93072-43	111	101	113	104	110	100	99
SV95073-17	94	102	102	104	101	100	98
SV93101-1-22	97	100	103	108	90	98	99
Site mean	6801	3028	3948	12787	11980	14551	12459
Sow date	28/4	7/6	31/5	3/6	31/5	15/5	11/5
Stress factors	de	de,v	wd	sr,lr,b,p	sr,lr,p	sr,lr	sr,lr,l

Stress factors: sr=stem rust, lr=leaf rust, p=septoria, b=bydv, wd=weed competition, de=moisture stress pre-flowering, v=variable site, l=lodging

Table 8. Grain yield (kg/ha) for entries in the 2000 stage 5 hay trials grown at six locations in South Australia and two locations in Victoria.

Variety/Line	Waikerie	Loxton	Minnipa	Greenpatch	Kybybolite	Cooke Plains	Rutherglen	St. Arnaud	Mean	Mean % Marloo
Bettong	1732	684	1614	2679	2290	1558	2163	1280	1750	98
Marloo	1652	774	1358	2103	2079	1694	3721	886	1784	100
Swan	1312	763	1432	2625	1530	1359	3944	715	1710	96
Wallaroo	1634	1000	1449	2907	1970	1634	3712	1498	1975	111
Glider	1526	426	1241	1784	3732	1080	2649	2716	1894	106
Eurabbie	1888	470	1413	3290	2178	1870	3538	2157	2101	118
SV87103-109	1627	647	1447	2684	2264	1527	4108	1325	1953	110
SV88083-4	1784	858	1572	2523	1611	1720	3208	1009	1786	100
SV93033-21	1737	582	1424	2686	2456	2138	4283	1784	2136	120
SV93072-43	1772	665	1619	2161	2896	1718	3760	2317	2113	118
SV95073-17	1373	923	1468	3015	2914	1332	3002	2808	2104	118
SV93101-1-22	1565	648	1525	2682	2281	1504	4059	3345	2201	123
Site Mean	1634	703	1464	2595	2350	1594	3512	1851		
Coeff. Variation (%)	12.2	28.6	14.9	11.5	14.0	10.8	11.5	20.9		
LSD (0.05)	520	510	340	1220	1730	790	1880	725		

Table 9. Grain yield expressed as a percent of the site mean yield for entries in the 2000 stage 5 hay trials grown six sites in South Australia. and two sites in Victoria.

Variety/Line	Waikerie	Loxton	Minnipa	Greenpatch	Kybybolite	Cooke Plains	Rutherglen	St. Arnaud
Bettong	106	97	110	103	97	98	62	69
Marloo	101	110	93	81	88	106	106	48
Swan	80	109	98	101	65	85	112	39
Wallaroo	100	142	99	112	84	103	106	81
Glider	93	61	85	69	159	68	75	147
Eurabbie	116	67	96	127	93	117	101	117
SV87103-109	100	92	99	103	96	96	117	72
SV88083-4	109	122	107	97	69	108	91	55
SV93033-21	106	83	97	104	105	134	122	96
SV93072-43	108	95	111	83	123	108	107	125
SV95073-17	84	131	100	116	124	84	85	152
SV93101-1-22	96	92	104	103	97	94	116	181

Table 10. Dry matter production (kg/ha) for the 32 entries in the 2000 stage 4 hay trial sown at three sites in South Australia.

Variety/Line	Birdwood		Turretfield		Pinery		Mean	
	kg/ha	% Marloo	kg/ha	% Marloo	kg/ha	% Marloo	kg/ha	% Marloo
BETTONG	16107	99	13805	111	9360	87	13091	99
MARLOO	16289	100	12481	100	10782	100	13184	100
SWAN	15582	96	13829	111	10359	96	13257	101
WALLAROO	15580	96	13655	109	10842	101	13359	101
GLIDER	16248	100	12732	102	9864	91	12948	98
EURABBIE	15844	97	12995	104	9957	92	12932	98
SV87103-109	16270	100	13129	105	11037	102	13479	102
SV88083-4	16838	103	14121	113	10926	101	13961	106
SV93033-21	15831	97	13697	110	10953	102	13493	102
SV93072-43	16565	102	13814	111	10594	98	13657	104
SV95073-17	16887	104	14841	119	10530	98	14086	107
SV93101-1-22	16308	100	12946	104	9909	92	13054	99
ECHIDNA	15778	97	13546	109	9624	89	12983	98
SV91169-110	16555	102	14851	119	10322	96	13909	106
SV93074-27	16103	99	13945	112	10546	98	13531	103
SV93127-12	16450	101	12889	103	10737	100	13359	101
94043-0KG-9WT	14920	92	13438	108	9636	89	12665	96
95017-103TR	15276	94	12227	98	10410	97	12638	96
95017-119TR	16260	100	13414	107	10029	93	13235	100
95017-179TR	15554	95	12548	101	10392	96	12831	97
95018-4TR	15643	96	12488	100	9811	91	12647	96
95018-20TR	15712	96	13355	107	10588	98	13218	100
95018-41TR	16231	100	13197	106	9892	92	13106	99
95018-73TR	15492	95	13488	108	9798	91	12926	98
95018-78TR	15091	93	12912	103	10681	99	12895	98
95018-98TR	15967	98	13976	112	9809	91	13251	101
95073-13TR	16400	101	14419	116	10270	95	13696	104
95073-44TR	15824	97	14457	116	11075	103	13785	105
95076-16TR	15980	98	14020	112	10571	98	13524	103
95077-4TR	15677	96	14408	115	10907	101	13664	104
TAMO397	16027	98	13525	108	9668	90	13073	99
WARREGO	16245	100	12714	102	9716	90	12891	98
Site Mean	15985		13496		10300			
Coeff. Variation (%)	12.0		7.0		9.2			
LSD (0.05)	2200		2280		1790			

The stage 4 hay trials are also evaluated for grain yield. Data are shown in Table 11 for the 32 entries in the 2000 stage 4 hay trial sown at four sites. The fourth site is sown in a CCN infested paddock to evaluate CCN tolerance. All of the advanced breeding lines yielded more grain than Marloo when averaged over the three sites in South Australia, with the exception of SV88083-4 and SV91169-110. However, the differences were not statistically significant.

Table 11. Grain yield (kg/ha) for the 32 entries in the 2000 stage 4 hay trial sown at four sites in South Australia.

Variety/Line	Birdwood		Turretfield		Pinery		Mean		Hoyleton (CCN)	
	kg/ha	% Marloo	kg/ha	% Marloo	kg/ha	% Marloo	kg/ha	% Marloo	kg/ha	% Marloo
BETTONG	1836	85	1849	103	2146	82	1944	89	2366	97
MARLOO	2152	100	1796	100	2613	100	2187	100	2435	100
SWAN	2593	120	1518	85	2595	99	2235	102	2216	91
WALLAROO	2746	128	2212	123	2934	112	2631	120	2171	89
GLIDER	2489	116	2038	113	1831	70	2120	97	2516	103
EURABBIE	1919	89	2369	132	2891	111	2393	109	2743	113
SV87103-109	2539	118	2013	112	2251	86	2268	104	2590	106
SV88083-4	2290	106	1441	80	2668	102	2133	98	2804	115
SV93033-21	2922	136	1794	100	2606	100	2441	112	2801	115
SV93072-43	2471	115	2156	120	2667	102	2431	111	2662	109
SV95073-17	2544	118	2800	156	2822	108	2722	124	2818	116
SV93101-1-22	2907	135	2578	144	2499	96	2661	122	2578	106
ECHIDNA	2751	128	2709	151	3121	119	2860	131	3151	129
SV91169-110	1939	90	1665	93	2696	103	2100	96	2575	106
SV93074-27	2547	118	2396	133	3031	116	2658	122	2720	112
SV93127-12	2840	132	2542	142	3032	116	2804	128	3099	127
94043-0KG-9WT	2430	113	2715	151	2806	107	2650	121	2792	115
95017-103TR	3072	143	2230	124	2503	96	2602	119	2689	110
95017-119TR	2729	127	2479	138	2115	81	2441	112	2405	99
95017-179TR	2894	134	2217	123	2523	97	2545	116	2604	107
95018-4TR	2598	121	2303	128	2148	82	2350	107	2697	111
95018-20TR	2566	119	2608	145	2347	90	2507	115	2682	110
95018-41TR	2755	128	2117	118	1900	73	2257	103	2438	100
95018-73TR	2853	133	2666	148	2168	83	2562	117	2822	116
95018-78TR	2775	129	2356	131	2223	85	2451	112	2534	104
95018-98TR	2808	130	2281	127	2338	89	2475	113	2461	101
95073-13TR	2853	133	2840	158	2575	99	2756	126	2708	111
95073-44TR	2566	119	2992	167	2704	103	2754	126	2830	116
95076-16TR	2448	114	2334	130	2455	94	2412	110	2514	103
95077-4TR	2808	130	2162	120	2623	100	2531	116	2965	122
PACIFICSEEDS1	3190	148	2461	137	2675	102	2776	127	2625	108
WARREGO	2412	112	1734	97	1924	74	2023	93	2052	84
Site Mean	2601		2262		2513				2627	
Coeff. Variation (%)	17.9		12.5		12.1				9.7	
LSD (0.05)	1070		1160		1030				770	

Both hay and grain quality were evaluated for the stage 4 and stage 5 trial entries. Tables 12 to 18 show data for digestibility, crude protein, nitrate, shear energy, water soluble carbohydrates, acid detergent fibre, and neutral detergent fibre for entries grown in the stage 5 trials. Hectolitre weight, 1000 grain weight, and screenings percent for grain of entries grown in the 2000 stage 5 hay trials are shown in Tables 19 to 21. Since the stage 5 entries are a subset of the stage 4 entries, quality data from both trials will be discussed together. Tables 22 to 25 show data for digestibility, crude protein, nitrate, shear energy, water soluble carbohydrates, acid detergent fibre, and neutral detergent fibre for

entries grown in the stage 4 trials. Hectolitre weight, 1000 grain weight, and screenings percent for grain of entries grown in the 2000 stage 4 hay trials are shown in Tables 26 to 28.

Average digestibility values from three sites varied from 58.3% to 62.9% (Table 22). Eurabbie is a grazing/feed variety included in the trials for its exceptional quality. Eurabbie had the highest digestibility percentage at 62.9%. There were eight advanced breeding lines with improved digestibility, ranging from 2.4 to 3.9% higher than Marloo. Two advanced breeding lines being increased for release had superior digestibility to the current varieties. SV87103-109 had 60.9% and SV93072-43 had 61.7%. Four lines from the crosses 95017 and 95018 were between 60.8 and 62.2%. These were single crosses between adapted South Australian lines and Brazilian germplasm. Unfortunately, the lines were lodging susceptible and were recycled into the crossing program for further improvement.

Averages for crude protein values varied from 7.7 to 10.2 % (Table 23). Marloo had 9.5% crude protein compared to Swan with 8.0%, Glider with 8.3%, and Eurabbie with 9.0%. Most advanced breeding lines had crude protein contents between 8.0% and 9.5%. SV95076-16 had the lowest crude protein content of 7.7% and the Pacific Seeds line, TAMO397 had the highest content of 10.2%

Nitrate content varied greatly among entries in the stage 4 trial (Table 23). The mean values ranged from 36 ug/mg in Echidna to 99 ug/mg in the line SV95018-98. Marloo had lowest nitrate content of the current hay varieties at 43 ug/mg .

Mean shear energy values ranged from 11.7 to 13.6 kJ/m^2 in the 2000 stage 4 hay trial entries (Table 24). Eurabbie had the lowest shear energy value 12.2 kJ/m^2 of the current hay varieties. SV93072-43 required less energy than the current varieties. Marloo, Glider, Swan, Bettong, and SV87103-109 were similar. Wallaroo and SV88083-4 were slightly higher than the other varieties with shear energy values of 13.5 kJ/m^2 .

Water soluble carbohydrate data are shown in Table 24. The mean values varied from Marloo 13.4% to the advanced breeding line SV95018-98 which had 20.8% water soluble carbohydrates. There was a 7.4% difference from the lowest to the highest level. Bettong, Swan, Wallaroo, and Eurabbie had similar water soluble carbohydrate contents. Glider was about 2% higher than the other hay varieties. Both SV87103-109 and SV93072-43 had 18.0 and 18.7% water soluble carbohydrates. Although SV88083-4 was 3.2% higher than Marloo, it was slightly less than Swan and Wallaroo. Advanced lines from the cross 95018 generally had the highest levels of water soluble carbohydrates. The brazilian parent UFRGS881969 in this cross will be further evaluated for potential to improve water soluble carbohydrate levels in future oat varieties.

Acid and neutral detergent fibre data are shown in Table 25. Mean values for acid detergent fibre ranged from 31.5% in SV95018-98 to 36.5% in SV95076-16. Current hay varieties clustered between 33 and 34% acid detergent fibre. Mean values for neutral detergent fibre ranged from 52.3% in SV95018-98 to 58.0% in SV931127-12. Current hay varieties clustered between 55 and 57% neutral detergent fibre. The advanced breeding line SV95018-98 had the lowest acid and neutral detergent fibre, the highest water soluble carbohydrate level, and the lowest shear energy in the trial. Physical grain quality was also evaluated for the advanced breeding lines to provide information for expectations on grain quality. Mean hectolitre weight data is shown in Table 26. The varieties and advanced breeding lines varied from 37.6 kg/hl in Warrego to 49.8 kg/hl in SV93127-12 and SV95018-41. Glider had the lowest hectolitre weight of the released varieties at 42.3 kg/hl compared to Swan at 48.6 kg/hl. Marloo and Wallaroo were similar at 46.9 and 46.7 kg/hl, respectively.

Table 27 summarises the 1000 grain weight for the stage 4 entries grown in 2000. Mean grain wight values varied between 24.7 g in SV93074-27 and Warrego to 39.1 g in SV95017-103. Screenings percent is shown in Table 28. Mean values for screenings percent less than 2 mm varied from 1.8% in SV95018-41 to 21% in SV93101-1-22. Marloo produced 16.1% screenings less than 2 mm. SV87103-109 had 50% less screenings than Marloo, while SV88083-4 had 13% less and SV93072-43 had 42% less screenings than Marloo.

Table 12. Digestibility (% dm) for the 2000 stage 5 entries sown at four locations in South Australia and two locations in Victoria. (Results from CSIRO, WA; trials conducted by SARDI, Ag Vic and DNRE)

Variety/Line	*Murray Mallee*		*Eyre Pen*	*EP*	*Victoria*		*SA and Victoria*		
	Loxton	Waikerie	Minnipa	Greenpatch	Rutherglen	St. Arnaud	average mean	% Eurabbie	% Marloo
Bettong	67.8	60.2	60.9	60.0	54.2	57.4	60.1	94	99
Marloo	67.7	62.9	58.3	60.9	56.1	57.7	60.6	94	100
Swan	69.1	62.4	57.8	58.4	54.3	57.5	59.9	93	99
Wallaro	64.5	62.5	56.6	59.1	52.9	57.5	58.8	92	97
Glider	73.1	61.2	59.0	59.8	56.6	60.4	61.7	96	102
Eurabbie	73.1	65.1	65.0	65.2	58.0	59.1	64.2	100	106
SV87103-109	72.9	63.7	62.8	61.2	54.3	54.4	61.5	96	102
SV88083-4	68.8	60.6	61.0	56.6	54.1	54.1	59.2	92	98
SV93033-21	70.2	60.3	59.4	58.1	52.7	55.1	59.3	92	98
SV93072-43	69.1	61.7	58.4	57.1	53.8	59.1	59.9	93	99
SV95073-17	65.9	59.9	60.9	61.0	54.9	58.9	60.3	94	99
SV93101-1-22	66.2	59.6	66.3	59.8	59.1	55.8	61.2	95	101

Table 13. Crude protein (%) for the 2000 stage 5 entries sown at four locations in South Australia and two locations in Victoria (Results from CSIRO, WA; trials conducted by SARDI, Ag Vic and DNRE)

	Murray Mallee		*Eyre Pen*	*EP*	*Victoria*		*SA and Victoria*		
Variety/Line	**Loxton**	**Waikerie**	**Minnipa**	**Greenpatch**	**Rutherglen**	**St. Arnaud**	**average mean**	**% Eurabbie**	**% Marloo**
Bettong	12.0	6.5	9.6	5.8	7.1	3.6	7.4	83	89
Marloo	12.5	6.9	9.5	7.3	7.2	6.7	8.3	93	100
Swan	12.3	6.0	8.4	4.6	6.7	4.1	7.0	78	84
Wallaro	11.0	6.8	7.9	7.5	6.5	6.3	7.7	86	92
Glider	14.8	7.5	5.5	6.9	7.7	5.7	8.0	89	96
Eurabbie	15.5	7.5	9.6	8.9	7.9	4.3	9.0	100	107
SV87103-109	13.9	6.6	7.3	9.1	5.6	4.2	7.8	87	93
SV88083-4	13.7	5.6	10.4	6.0	6.9	5.4	8.0	89	96
SV93033-21	12.7	6.6	7.6	5.9	6.4	6.5	7.6	85	91
SV93072-43	14.0	6.6	7.7	6.2	7.2	4.2	7.7	85	92
SV95073-17	12.1	7.2	9.4	8.2	6.1	6.4	8.2	92	99
SV93101-1-22	12.4	7.6	10.2	6.8	9.0	5.1	8.5	95	102

Table 14. Nitrate (ug/mg, dm) for the 2000 stage 5 entries sown at four locations in South Australia and two locations in Victoria. (Results from CSIRO, WA; trials conducted by SARDI, Ag Vic and DNRE)

Variety/Line	*Murray Mallee*		*Eyre Pen*	*EP*	*Victoria*		*SA and Victoria*		
	Loxton	Waikerie	Minnipa	Greenpatch	Rutherglen	St. Arnaud	mean	average % Eurabbie	% Marloo
Bettong	98	72	44	108	81	117	86	89	113
Marloo	90	98	36	75	91	68	76	79	100
Swan	101	107	26	108	79	107	88	91	115
Wallaro	54	102	25	84	66	71	67	69	88
Glider	119	67	59	87	62	114	85	87	111
Eurabbie	118	100	97	104	65	98	97	100	127
SV87103-109	118	118	90	57	61	82	87	90	115
SV88083-4	87	118	69	99	76	72	87	90	114
SV93033-21	101	65	79	116	89	**	90	93	118
SV93072-43	88	106	42	49	56	116	76	79	100
SV95073-17	69	66	72	97	70	93	78	80	102
SV93101-1-22	81	51	103	99	85	67	81	83	106

Table 15. Shear energy (kJ/m^2)for the 2000 stage 5 entries sown at four locations in South Australia and two locations in Victoria. (Results from CSIRO, WA; trials conducted by SARDI, Ag Vic and DNRE)

Variety/Line	*Murray Mallee*		*Eyre Pen*	*EP*	*Victoria*		*SA and Victoria*		
	Loxton	Waikerie	Minnipa	Greenpatch	Rutherglen	St. Arnaud	mean	average % Eurabbie	% Marloo
Bettong	7.5	9.7	12.5	11.5	16.5	12.7	11.7	122	100
Marloo	6.6	9.9	13.8	12.2	14.9	13.2	11.8	123	100
Swan	5.7	8.8	14.6	11.6	15.6	13.0	11.5	120	98
Wallaro	9.8	9.4	14.2	14.5	16.3	13.8	13.0	136	111
Glider	4.3	10.5	15.8	12.9	14.9	11.0	11.6	121	98
Eurabbie	3.2	6.9	10.3	9.7	15.2	12.3	9.6	100	81
SV87103-109	4.6	9.3	12.1	11.9	15.9	13.8	11.3	117	96
SV88083-4	5.5	11.0	13.5	12.6	15.7	14.4	12.1	126	103
SV93033-21	5.7	10.9	14.9	12.2	15.6	12.7	12.0	125	102
SV93072-43	6.7	10.7	15.0	12.9	15.5	13.0	12.3	128	105
SV95073-17	7.4	10.5	12.2	11.8	14.2	12.4	11.4	119	97
SV93101-1-22	7.1	9.9	9.3	10.7	13.9	13.4	10.7	112	91

Table 16. Water soluble carbohydrates (%, dm basis) for the 2000 stage 5 entries sown at four locations in South Australia and two locations in Victoria. (Results from CSIRO, WA; trials conducted by SARDI, Ag Vic and DNRE)

Variety/Line	*Murray Mallee*		*Eyre Pen*	*EP*	*Victoria*		*SA and Victoria*		
	Loxton	Waikerie	Minnipa	Greenpatch	Rutherglen	St. Arnaud	mean	average % Eurabbie	% Marloo
Bettong	16.5	17.6	9.3	25.2	13.2	25.5	17.9	94	119
Marloo	16.1	19.4	5.5	20.8	15.0	12.9	15.0	79	100
Swan	17.1	23.1	7.0	27.1	13.7	25.2	18.8	99	126
Wallaro	12.9	21.1	7.3	17.0	11.5	15.9	14.3	75	96
Glider	21.5	20.8	10.9	22.5	13.4	26.6	19.3	101	129
Eurabbie	19.4	26.5	11.7	26.8	10.1	19.8	19.1	100	127
SV87103-109	19.6	23.0	15.6	20.5	13.3	15.8	18.0	94	120
SV88083-4	13.1	23.8	8.6	20.3	12.1	11.9	14.9	78	100
SV93033-21	20.1	22.0	9.5	24.2	14.6	11.8	17.0	89	114
SV93072-43	16.4	18.1	5.6	19.8	10.6	25.5	16.0	84	107
SV95073-17	14.7	16.3	8.6	24.7	15.6	18.5	16.4	86	110
SV93101-1-22	14.6	15.4	13.3	21.8	11.9	16.5	15.6	82	104

Table 17. Acid detergent fibre (%, dm basis) for the 2000 stage 5 entries sown at four locations in South Australia and two locations in Victoria. (Results from CSIRO, WA; trials conducted by SARDI, Ag Vic and DNRE)

Variety/Line	*Murray Mallee*		*Eyre Pen*	*EP*	*Victoria*		*SA and Victoria*		
	Loxton	Waikerie	Minnipa	Greenpatch	Rutherglen	St. Arnaud	mean	average % Eurabbie	% Marloo
Bettong	24.3	27.0	32.5	34.5	43.4	34.9	32.8	119	106
Marloo	22.4	25.9	34.6	29.7	39.2	33.8	30.9	113	100
Swan	21.3	24.9	35.7	34.0	40.6	32.7	31.6	115	102
Wallaro	26.2	25.4	36.2	36.1	43.1	33.4	33.4	122	108
Glider	17.9	27.1	35.9	32.2	38.9	30.8	30.5	111	98
Eurabbie	16.8	22.2	29.4	24.8	38.8	32.7	27.4	100	89
SV87103-109	18.8	25.4	32.1	29.1	42.1	38.5	31.0	113	100
SV88083-4	21.7	28.4	32.4	35.7	41.9	37.4	32.9	120	106
SV93033-21	20.4	27.7	37.2	35.2	42.9	31.2	32.4	118	105
SV93072-43	21.9	29.5	36.6	33.0	42.0	34.8	32.9	120	106
SV95073-17	23.4	26.7	33.9	30.5	40.0	34.5	31.5	115	102
SV93101-1-22	24.0	26.2	29.4	32.0	37.6	36.4	30.9	113	100

Table 18. Neutral detergent fibre (%, dm basis) for the 2000 stage 5 entries sown at four locations in South Australia and two locations in Victoria. (Results from CSIRO, WA; trials conducted by SARDI, Ag Vic and DNRE)

Variety/Line	*Murray Mallee*		*Eyre Pen*	*EP*	*Victoria*		*SA and Victoria*		
	Loxton	Waikerie	Minnipa	Greenpatch	Rutherglen	St. Arnaud	average mean	% Eurabbie	% Marloo
Bettong	41.1	47.6	55.6	53.7	64.2	54.7	52.8	112	102
Marloo	39.9	45.4	57.4	51.7	61.1	55.5	51.8	110	100
Swan	37.5	44.3	59.1	54.1	61.8	53.3	51.7	110	100
Wallaro	46.1	44.0	58.4	58.4	65.5	54.5	54.5	116	105
Glider	32.2	47.0	59.6	53.7	61.4	49.7	50.6	108	98
Eurabbie	31.5	40.3	48.9	45.5	62.4	53.7	47.1	100	91
SV87103-109	35.2	43.8	51.7	51.5	63.9	59.4	50.9	108	98
SV88083-4	36.3	47.7	53.8	54.2	63.8	57.7	52.3	111	101
SV93033-21	36.8	48.7	58.6	53.8	63.8	56.3	53.0	113	102
SV93072-43	39.1	48.7	59.9	55.3	65.4	55.0	53.9	115	104
SV95073-17	41.9	48.4	54.0	52.1	63.1	55.2	52.5	111	101
SV93101-1-22	41.5	49.0	46.9	52.4	59.9	59.0	51.4	109	99

Table 19. Hectolitre weight (kg/hl) for 2000 stage 5 entries grown at three locations in South Australia

Variety/Line	Waikerie	Loxton	Minnipa	*SA and Victoria* average		
				mean	% Marloo	% Swan
Bettong	49.2	48.3	50.7	49.4	108	104
Marloo	47.8	43.5	46.0	45.8	100	96
Swan	50.9	45.9	45.8	47.6	104	100
Wallaro	47.4	43.7	42.5	44.5	97	94
Glider	43.9	38.9	42.6	41.8	91	88
Eurabbie	47.5	41.4	46.6	45.2	99	95
SV87103-109	47.8	43.4	44.8	45.3	99	95
SV88083-4	49.1	44.7	47.8	47.2	103	99
SV93033-21	50.3	42.2	50.6	47.7	104	100
SV93072-43	47.1	42.0	46.7	45.2	99	95
SV95073-17	47.4	44.4	40.9	44.2	97	93
SV93101-1-22	45.0	42.9	40.3	42.7	93	90

Table 20. 1000 Grain weight (g) for 2000 stage 5 entries grown at three locations in South Australia

Variety/Line	Waikerie	Loxton	Minnipa	*SA and Victoria* average		
				mean	% Marloo	% Swan
Bettong	38.0	33.6	33.4	35.0	110	108
Marloo	34.2	32.4	28.8	31.8	100	98
Swan	38.4	30.6	28.2	32.4	102	100
Wallaro	32.2	33.0	25.0	30.1	95	93
Glider	29.6	20.6	28.8	26.3	83	81
Eurabbie	31.2	22.6	28.0	27.3	86	84
SV87103-109	31.6	25.4	27.4	28.1	88	87
SV88083-4	39.0	31.6	30.4	33.7	106	104
SV93033-21	32.8	20.0	30.0	27.6	87	85
SV93072-43	33.8	23.0	29.0	28.6	90	88
SV95073-17	33.8	30.6	24.8	29.7	94	92
SV93101-1-22	32.4	30.6	24.6	29.2	92	90

Table 21. Screenings percent (<2mm) for 2000 stage 5 entries grown at three locations in SouthAustralia.

Variety/Line	*Mallee*		*Central*	*SA and Victoria*		
	Waikerie	Loxton	Minnipa	average mean	% Marloo	% Swan
Bettong	2.4	5.8	7.4	5.2	30	34
Marloo	9.2	14.4	28.2	17.3	100	112
Swan	4.4	7.6	34.2	15.4	89	100
Wallaro	13.8	12.2	47.8	24.6	142	160
Glider	16.2	22.4	16.8	18.5	107	120
Eurabbie	9.6	9.4	13.0	10.7	62	69
SV87103-109	11.8	13.8	24.2	16.6	96	108
SV88083-4	3.4	10.0	20.6	11.3	66	74
SV93033-21	5.8	13.6	15.0	11.5	66	74
SV93072-43	7.6	8.4	16.0	10.7	62	69
SV95073-17	4.0	18.0	42.8	21.6	125	140
SV93101-1-22	12.0	14.8	40.4	22.4	130	145

Table 22. Digestibility (% dm) for 2000 stage 4 entries sown at three sites in South Australia. (Results from CSIRO, WA; trials conducted by Oat Breeding Unit)

Variety/Line	*In vitro Dry Matter Digestibility (IVD) (%)*						
	Pinery	Turret-field	Bird-wood	average			Liquid N
				mean	% Eurabbie	% Marloo	
BETTONG	59.7	61.0	58.5	59.7	95	103	55.2
MARLOO	61.6	56.2	57.0	58.3	93	100	56.3
SWAN	59.4	58.3	57.4	58.3	93	100	60.8
WALLAROO	60.7	57.6	58.2	58.9	94	101	58.8
GLIDER	61.7	60.5	56.4	59.5	95	102	54.4
EURABBIE	65.9	64.2	58.7	62.9	100	108	59.4
SV87103-109	62.9	62.3	57.4	60.9	97	104	58.5
SV88083-4	61.4	61.2	56.4	59.7	95	102	52.7
SV93033-21	63.4	59.1	55.1	59.2	94	102	55.7
SV93072-43	62.8	61.9	60.4	61.7	98	106	55.7
SV95073-17	59.5	62.6	56.4	59.5	95	102	55.1
SV93101-1-22	62.3	61.5	57.7	60.5	96	104	60.5
ECHIDNA	59.1	58.7	57.1	58.3	93	100	57.1
SV91169-110	64.5	62.7	54.7	60.6	96	104	55.3
SV93074-27	65.4	61.0	58.1	61.5	98	106	54.6
SV93127-12	58.0	59.0	56.8	57.9	92	99	55.2
94043-0KG-9WT	64.0	61.8	56.1	60.7	96	104	55.8
95017-103TR	59.8	63.9	59.9	61.2	97	105	57.9
95017-119TR	61.7	58.1	57.1	59.0	94	101	57.6
95017-179TR	64.1	61.4	59.4	61.7	98	106	62.4
95018-4TR	62.8	59.7	57.4	60.0	95	103	58.5
95018-20TR	60.9	60.2	54.8	58.7	93	101	59.9
95018-41TR	63.0	62.1	57.5	60.8	97	104	55.6
95018-73TR	60.3	58.7	58.0	59.0	94	101	61.2
95018-78TR	60.1	61.4	59.3	60.3	96	104	61.4
95018-98TR	64.2	63.3	59.0	62.2	99	107	57.8
95073-13TR	59.9	61.1	57.2	59.4	94	102	57.6
95073-44TR	59.0	60.9	57.9	59.3	94	102	58.3
95076-16TR	58.4	55.0	55.5	56.3	89	97	54.3
95077-4TR	62.7	59.8	57.7	60.1	95	103	65.4
TAMO397	62.5	63.4	57.5	61.1	97	105	57.1
WARREGO	63.3	60.1	56.4	59.9	95	103	55.7

Table 23. 2000 South Australian Stage 4 hay trial results for crude protein (%) and nitrate (ug/mg)

	*Crude Protein (% dm basis, N*6.25)*							*Nitrate (ug/mg dm basis)*						
Variety/line	**Pinery**	**Turret-**	**Bird-**	**average**			**Liquid**	**Pinery**	**Turret-**	**Bird-**	**average**			**Liquid**
		field	**wood**	**mean**	**% Eurabbie**	**% Marloo**	**N**		**field**	**wood**	**mean**	**% Eurabbie**	**% Marloo**	**N**
BETTONG	8.2	10.4	8.9	9.2	102	97	8.5	59	76	69	68	85	158	57
MARLOO	10.8	9.0	8.6	9.5	102	97	6.7	49	49	31	43	54	100	56
SWAN	7.2	9.6	7.3	8.0	102	97	7.2	73	50	53	59	73	136	71
WALLAROO	7.8	8.9	8.6	8.5	102	97	7.9	63	37	85	62	77	144	86
GLIDER	8.2	8.8	8.0	8.3	102	97	7.7	60	84	60	68	84	158	**
EURABBIE	9.1	8.9	9.1	9.0	102	97	9.1	100	77	65	80	100	187	67
SV87103-109	8.4	10.2	7.2	8.6	102	97	8.1	90	87	67	81	101	189	63
SV88083-4	8.2	10.2	8.1	8.9	102	97	6.8	94	89	80	88	109	204	67
SV93033-21	9.2	9.4	7.1	8.6	102	97	5.5	94	86	46	75	94	175	93
SV93072-43	8.7	11.3	8.0	9.3	102	97	6.2	95	77	96	89	111	207	63
SV95073-17	8.2	9.7	7.7	8.6	102	97	7.1	60	101	56	72	90	168	70
SV93101-1-22	8.0	10.3	8.8	9.1	102	97	7.8	82	99	79	87	108	202	81
ECHIDNA	8.3	10.5	9.1	9.3	102	97	8.5	24	40	44	36	45	84	62
SV91169-110	8.9	12.2	8.3	9.8	102	97	6.7	99	82	35	72	89	167	55
SV93074-27	10.1	8.8	7.7	8.9	102	97	8.1	93	96	68	86	107	199	39
SV93127-12	8.0	9.9	7.3	8.4	102	97	6.8	42	69	63	58	72	134	49
94043-0KG-9WT	8.4	11.7	8.8	9.6	102	97	9.6	92	68	36	65	81	151	6
95017-103TR	7.6	9.5	8.7	8.6	102	97	5.8	42	110	84	79	98	183	114
95017-119TR	9.4	8.7	8.5	8.8	102	97	8.3	77	78	73	76	94	176	79
95017-179TR	9.4	10.2	8.8	9.5	102	97	7.2	83	75	99	86	107	200	123
95018-4TR	8.9	8.9	8.6	8.8	102	97	8.1	84	67	74	75	93	174	68
95018-20TR	7.7	8.6	7.5	7.9	102	97	6.4	78	76	93	82	102	191	126
95018-41TR	8.9	9.9	8.7	9.1	102	97	6.2	87	85	88	87	108	202	75
95018-73TR	8.7	8.0	9.1	8.6	102	97	7.4	56	75	84	72	89	167	108
95018-78TR	8.0	8.9	9.0	8.6	102	97	8.7	67	92	95	85	105	197	114
95018-98TR	8.8	10.1	8.2	9.0	102	97	7.2	102	101	96	99	124	231	91
95073-13TR	7.5	9.5	10.0	9.0	102	97	6.8	66	106	64	79	98	182	101
95073-44TR	7.9	10.2	10.0	9.4	102	97	6.1	48	89	60	66	82	153	91
95076-16TR	7.3	8.1	7.8	7.7	102	97	8.4	60	79	82	74	92	171	37
95077-4TR	8.9	9.9	8.2	9.0	102	97	8.4	78	78	74	77	95	178	159
TAMO397	8.9	11.7	9.9	10.2	102	97	9.1	71	93	65	76	95	177	70
WARREGO	9.8	9.6	8.4	9.2	102	97	8.8	78	82	69	76	95	177	45

Table 24. 2000 South Australian Stage 4 Hay Trial Results for shear energy (kJ/m2) and water soluble carbohydrates (%)

	Shear Energy (kJ/m2)							*Water Soluble Carbohydrate (WSC) (%, dm basis)*						
Variety/line	**Pinery**	**Turret-**	**Bird-**	**average**			**Liquid**	**Pinery**	**Turret-**	**Bird-**	**average**			**Liquid**
		field	**wood**	**mean**	**% Eurabbie**	**% Marloo**	**N**		**field**	**wood**	**mean**	**% Eurabbie**	**% Marloo**	**N**
BETTONG	12.6	11.9	14.1	12.9	106	99	16.7	19.8	15.5	14.8	16.7	100	125	13.7
MARLOO	11.7	14.4	13.0	13.0	107	100	14.1	15.7	11.1	13.3	13.4	80	100	21.0
SWAN	12.3	13.6	13.4	13.1	107	101	12.7	21.4	12.4	17.1	17.0	101	127	22.1
WALLAROO	12.7	13.4	14.4	13.5	111	104	13.8	20.3	15.0	17.2	17.5	104	131	20.4
GLIDER	11.9	11.6	15.5	13.0	106	100	13.9	20.9	21.6	14.6	19.0	113	143	18.6
EURABBIE	10.3	11.5	14.8	12.2	100	94	15.9	22.4	17.4	10.5	16.8	100	126	13.4
SV87103-109	11.7	12.6	14.8	13.1	107	100	14.5	22.3	17.5	14.2	18.0	107	135	20.1
SV88083-4	12.1	13.2	15.2	13.5	111	104	15.7	20.9	14.7	14.3	16.6	99	124	18.8
SV93033-21	11.2	12.4	13.9	12.5	102	96	14.6	21.7	17.3	15.8	18.3	109	137	26.5
SV93072-43	12.8	12.4	12.4	12.5	103	96	13.9	20.5	15.8	19.8	18.7	112	140	25.5
SV95073-17	12.8	12.7	14.0	13.1	108	101	14.4	17.2	19.2	15.5	17.3	103	129	19.4
SV93101-1-22	12.1	12.4	14.8	13.1	107	100	13.0	18.3	16.6	14.8	16.5	99	124	22.7
ECHIDNA	12.7	14.1	13.5	13.5	110	103	13.3	15.9	9.2	10.5	11.9	71	89	16.5
SV91169-110	11.7	12.3	15.4	13.1	108	101	12.5	22.8	14.2	12.1	16.4	98	123	25.4
SV93074-27	11.4	11.9	13.0	12.1	99	93	16.0	18.5	17.9	16.4	17.6	105	132	16.5
SV93127-12	13.3	14.0	13.6	13.6	112	105	14.3	17.0	14.8	19.8	17.2	102	129	23.1
94043-0KG-9WT	11.5	13.6	14.2	13.1	107	101	13.5	23.6	11.1	9.1	14.6	87	109	10.3
95017-103TR	12.4	11.1	13.8	12.5	102	96	14.1	15.3	23.8	13.0	17.3	103	130	26.0
95017-119TR	12.0	13.0	14.3	13.1	107	100	13.3	17.5	15.2	10.0	14.2	85	107	19.6
95017-179TR	11.7	12.2	14.5	12.8	105	98	12.3	18.6	15.3	14.8	16.2	97	122	26.2
95018-4TR	11.5	12.6	13.8	12.6	104	97	12.2	17.0	16.0	15.1	16.0	96	120	20.5
95018-20TR	10.9	12.2	14.7	12.6	103	97	10.7	21.6	21.3	18.7	20.6	123	154	31.5
95018-41TR	10.7	12.2	13.5	12.1	100	93	14.8	21.3	19.6	18.7	19.9	119	149	22.9
95018-73TR	10.9	12.9	13.2	12.3	101	95	10.5	18.9	19.8	15.6	18.1	108	135	29.7
95018-78TR	11.9	11.8	12.6	12.1	99	93	11.8	17.9	22.8	16.3	19.0	113	142	21.6
95018-98TR	10.4	10.5	14.1	11.7	96	90	12.4	23.1	21.5	17.7	20.8	124	156	25.4
95073-13TR	12.4	12.3	15.3	13.3	109	102	15.0	18.1	22.0	10.9	17.0	101	127	24.1
95073-44TR	12.7	12.8	14.6	13.4	109	103	12.9	16.5	15.9	10.4	14.3	85	107	26.7
95076-16TR	12.6	13.8	14.2	13.5	111	104	13.9	20.1	18.7	16.5	18.4	110	138	20.4
95077-4TR	12.5	13.5	14.3	13.4	110	103	9.9	18.5	15.5	16.7	16.9	101	127	32.3
TAMO397	11.8	12.4	15.9	13.4	110	103	16.1	17.8	13.4	13.1	14.8	88	111	18.6
WARREGO	11.7	11.7	15.0	12.8	105	98	15.4	17.1	17.6	10.6	15.1	90	113	16.8

Table 25. 2000 South Australian Stage 4 Hay Trial Results for ADF (% dm basis) and NDF (% dm basis)

	Acid Detergent Fibre (ADF) (%, dm basis)							*Neutral Detergent Fibre (NDF) (%, dm basis)*						
Variety/line	**Pinery**	**Turret-**	**Bird-**	**average**			**Liquid**	**Pinery**	**Turret-**	**Bird-**	**average**			**Liquid**
		field	**wood**	**mean**	**% Eurabbie**	**% Marloo**	**N**		**field**	**wood**	**mean**	**% Eurabbie**	**% Marloo**	**N**
BETTONG	33.2	32.7	37.0	34.3	106	105	41.9	55.8	54.1	58.6	56.2	102	101	66.0
MARLOO	28.0	36.9	32.9	32.6	101	100	35.1	50.8	59.8	56.6	55.7	101	100	58.7
SWAN	33.5	33.7	34.7	33.9	105	104	31.4	55.3	56.3	58.2	56.6	103	102	55.0
WALLAROO	31.7	34.1	37.1	34.3	106	105	36.9	53.4	57.4	58.7	56.5	103	101	58.3
GLIDER	29.9	32.3	39.9	34.0	105	104	34.1	52.0	51.7	61.3	55.0	100	99	59.4
EURABBIE	27.7	31.1	38.1	32.3	100	99	39.2	49.2	54.4	61.1	54.9	100	99	63.9
SV87103-109	31.5	34.3	39.3	35.0	108	108	36.7	52.0	55.5	60.7	56.1	102	101	59.5
SV88083-4	33.0	33.9	39.2	35.4	109	109	41.4	53.0	54.9	59.7	55.9	102	100	61.9
SV93033-21	30.8	34.1	38.2	34.4	106	105	38.4	51.6	54.9	60.6	55.7	101	100	59.1
SV93072-43	33.5	31.5	34.8	33.2	103	102	36.6	55.3	54.2	54.8	54.8	100	98	58.5
SV95073-17	33.7	32.2	37.3	34.4	106	106	39.3	56.6	53.8	59.7	56.7	103	102	61.9
SV93101-1-22	32.5	33.5	38.7	34.9	108	107	33.2	55.0	55.1	60.9	57.0	104	102	55.6
ECHIDNA	31.7	33.3	35.3	33.4	103	103	36.4	56.2	55.8	58.0	56.6	103	102	57.7
SV91169-110	30.8	31.8	38.8	33.8	105	104	35.1	51.3	53.6	62.4	55.8	102	100	56.5
SV93074-27	30.3	33.7	35.7	33.3	103	102	38.0	51.6	54.6	57.8	54.7	100	98	61.9
SV93127-12	35.5	35.0	36.5	35.7	110	109	35.1	58.2	57.4	58.3	58.0	106	104	57.1
94043-0KG-9WT	30.1	31.6	35.9	32.5	101	100	33.3	52.3	54.0	59.5	55.3	101	99	57.8
95017-103TR	32.3	30.9	37.3	33.5	104	103	37.8	55.8	51.9	58.2	55.3	101	99	57.8
95017-119TR	33.1	35.5	39.3	36.0	111	110	36.5	54.8	56.8	61.1	57.6	105	103	58.8
95017-179TR	30.8	31.9	39.0	33.9	105	104	33.6	52.4	53.1	60.3	55.3	101	99	54.2
95018-4TR	31.1	32.6	36.8	33.5	104	103	33.0	52.6	55.1	58.5	55.4	101	99	55.8
95018-20TR	31.6	32.1	39.5	34.4	106	106	31.9	52.9	54.1	60.9	56.0	102	100	50.0
95018-41TR	30.4	31.3	36.1	32.6	101	100	36.9	51.6	52.8	56.8	53.7	98	96	59.6
95018-73TR	30.1	34.5	34.8	33.1	103	102	30.3	52.4	56.4	56.7	55.2	100	99	50.0
95018-78TR	32.6	31.4	35.4	33.1	102	102	34.8	55.0	52.7	57.1	54.9	100	99	54.5
95018-98TR	29.6	28.4	36.4	31.5	97	97	34.7	49.9	49.6	57.3	52.3	95	94	55.3
95073-13TR	33.5	33.3	37.0	34.6	107	106	36.4	55.7	54.0	60.1	56.6	103	102	58.3
95073-44TR	32.7	32.9	35.3	33.6	104	103	33.3	55.8	53.8	57.8	55.8	102	100	54.8
95076-16TR	33.8	38.3	37.3	36.5	113	112	34.9	55.3	59.1	58.5	57.7	105	103	57.1
95077-4TR	32.2	34.9	37.7	34.9	108	107	30.3	54.1	56.2	59.8	56.7	103	102	45.5
TAMO397	31.5	32.2	38.8	34.2	106	105	39.2	53.9	53.6	62.0	56.5	103	101	62.8
WARREGO	30.6	33.9	40.2	34.9	108	107	38.1	51.0	52.8	61.2	55.0	100	99	63.1

Table 26. Hectolitre weight (kg/hl) for entries in the 2000 stage 4 hay trials sown in South Australia.

Variety/Line	*Mid North*			*Hills*	*State*		
	Pinery	Turret-field	Hoyleton	Bird-wood	average mean	% Swan	% Marloo
BETTONG	49.7	49.7	49.7	41.1	47.5	98	101
MARLOO	46.8	48.6	48.3	43.8	46.9	103	100
SWAN	48.6	48.1	50.6	47.2	48.6	107	104
WALLAROO	44.3	48.4	48.3	46.0	46.7	103	100
GLIDER	43.2	40.1	45.5	41.7	42.6	94	91
EURABBIE	45.2	43.8	46.3	34.2	42.3	93	90
SV87103-109	46.1	46.8	47.9	42.0	45.7	100	98
SV88083-4	47.0	44.1	48.4	39.1	44.7	98	95
SV93033-21	50.5	49.0	50.9	46.1	49.1	108	105
SV93072-43	47.0	45.0	46.9	40.2	44.8	98	96
SV95073-17	45.3	48.1	47.7	44.6	46.4	102	99
SV93101-1-22	43.3	46.1	48.0	40.0	44.3	97	95
ECHIDNA	48.6	46.9	47.4	39.2	45.5	100	97
SV91169-110	49.8	45.7	51.9	41.4	47.2	104	101
SV93074-27	45.8	46.4	47.5	41.8	45.4	100	97
SV93127-12	50.1	51.7	50.7	46.8	49.8	109	106
94043-0KG-9WT	46.9	46.8	47.5	40.1	45.3	100	97
95017-103TR	47.8	50.5	50.5	48.7	49.4	108	105
95017-119TR	48.1	50.9	50.4	46.2	48.9	107	104
95017-179TR	46.7	49.1	49.2	46.5	47.9	105	102
95018-4TR	47.2	49.9	49.9	48.1	48.8	107	104
95018-20TR	47.6	50.2	49.3	45.3	48.1	106	103
95018-41TR	49.1	51.6	50.6	47.8	49.8	109	106
95018-73TR	46.7	48.1	51.6	49.0	48.8	107	104
95018-78TR	43.7	48.2	48.1	45.4	46.3	102	99
95018-98TR	47.9	51.7	50.2	47.2	49.3	108	105
95073-13TR	44.8	49.0	48.6	43.3	46.4	102	99
95073-44TR	45.1	48.2	48.3	45.0	46.6	102	100
95076-16TR	48.4	51.7	51.3	45.8	49.3	108	105
95077-4TR	45.2	44.2	48.7	40.9	44.8	98	96
TAMO397	46.1	50.8	46.2	45.2	47.1	103	100
WARREGO	37.9	34.9	42.0	35.4	37.6	82	80

Table 27. 1000 grain weight (g) for entries in the 2000 stage 4 hay trials sown in South Australia.

Variety/Line	*Mid North*			*Hills*	*State* average		
	Pinery	Turretfield	Hoyleton	Birdwood	mean	% Swan	% Marloo
BETTONG	35.2	33.6	39.0	31.8	34.9	99	107
MARLOO	37.0	30.8	33.8	29.2	32.7	93	100
SWAN	37.0	29.2	41.4	33.4	35.3	100	108
WALLAROO	34.2	30.2	30.4	31.8	31.7	90	97
GLIDER	31.8	28.8	32.4	30.0	30.8	87	94
EURABBIE	28.4	26.0	25.6	20.8	25.2	71	77
SV87103-109	34.6	31.8	35.0	28.0	32.4	92	99
SV88083-4	35.8	27.8	36.2	27.2	31.8	90	97
SV93033-21	31.6	31.4	34.0	30.2	31.8	90	97
SV93072-43	34.0	26.4	34.0	27.2	30.4	86	93
SV95073-17	31.4	35.0	26.4	32.4	31.3	89	96
SV93101-1-22	32.6	31.0	32.6	25.2	30.4	86	93
ECHIDNA	30.2	27.0	29.4	24.6	27.8	79	85
SV91169-110	35.2	30.2	36.3	22.8	31.1	88	95
SV93074-27	27.6	24.6	25.0	21.6	24.7	70	76
SV93127-12	34.2	34.4	36.2	33.4	34.6	98	106
94043-0KG-9WT	34.2	26.6	29.4	25.4	28.9	82	88
95017-103TR	40.4	37.8	39.8	38.2	39.1	111	119
95017-119TR	28.4	32.4	25.2	28.8	28.7	81	88
95017-179TR	34.6	34.2	36.0	34.0	34.7	98	106
95018-4TR	34.8	34.8	38.6	39.2	36.9	105	113
95018-20TR	34.0	37.2	36.0	33.4	35.2	100	107
95018-41TR	32.6	38.0	34.2	31.2	34.0	96	104
95018-73TR	33.0	35.2	41.6	38.0	37.0	105	113
95018-78TR	32.8	34.2	34.4	35.4	34.2	97	105
95018-98TR	32.6	35.8	34.8	33.2	34.1	97	104
95073-13TR	31.6	36.8	28.8	32.4	32.4	92	99
95073-44TR	29.8	35.8	29.2	35.8	32.7	93	100
95076-16TR	35.0	39.6	32.4	35.2	35.6	101	109
95077-4TR	36.0	33.2	41.6	30.8	35.4	100	108
TAMO397	35.6	40.0	34.4	37.6	36.9	105	113
WARREGO	21.4	23.6	27.2	26.4	24.7	70	75

Table 28. Screenings percent (<2mm) for entries in the 2000 stage 4 hay trial sown in South Australia

Variety/Line	*Mid North*			*Hills*	*State*		
	Pinery	Turretfield	Hoyleton	Birdwood	mean	average % Swan	% Marloo
BETTONG	2.6	5.6	1.6	3.8	3.4	30	21
MARLOO	3.6	28.4	8.6	23.6	16.1	140	100
SWAN	2.0	33.4	4.0	6.6	11.5	100	72
WALLAROO	6.0	31.2	6.2	12.4	14.0	121	87
GLIDER	5.2	16.8	5.0	6.6	8.4	73	52
EURABBIE	3.8	15.8	11.6	24.2	13.9	120	86
SV87103-109	3.8	13.6	6.2	8.8	8.1	70	50
SV88083-4	3.0	29.0	6.0	17.8	14.0	121	87
SV93033-21	2.8	9.4	2.0	9.2	5.9	51	36
SV93072-43	3.4	15.4	4.4	14.0	9.3	81	58
SV95073-17	10.0	4.2	4.4	3.0	5.4	47	34
SV93101-1-22	11.4	13.0	13.8	45.6	21.0	182	131
ECHIDNA	5.6	19.0	10.6	12.4	11.9	103	74
SV91169-110	1.4	15.2	2.2	7.4	6.6	57	41
SV93074-27	8.6	20.8	12.2	36.4	19.5	170	121
SV93127-12	2.0	8.2	2.6	4.4	4.3	37	27
94043-0KG-9WT	4.8	22.2	18.2	16.2	15.4	133	96
95017-103TR	2.2	2.0	1.8	2.4	2.1	18	13
95017-119TR	6.6	7.8	5.4	6.4	6.6	57	41
95017-179TR	5.0	5.8	5.0	6.8	5.7	49	35
95018-4TR	2.4	4.4	1.4	1.4	2.4	21	15
95018-20TR	2.8	1.8	1.4	3.2	2.3	20	14
95018-41TR	2.4	1.4	1.0	2.4	1.8	16	11
95018-73TR	7.0	5.6	0.8	1.4	3.7	32	23
95018-78TR	8.8	4.8	2.4	2.0	4.5	39	28
95018-98TR	3.0	3.4	1.6	2.4	2.6	23	16
95073-13TR	8.4	4.8	7.2	4.0	6.1	53	38
95073-44TR	9.4	4.0	6.6	2.2	5.6	48	35
95076-16TR	3.2	2.2	2.4	1.0	2.2	19	14
95077-4TR	4.0	9.4	1.4	8.4	5.8	50	36
TAMO397	2.4	2.0	3.0	1.6	2.3	20	14
WARREGO	21.6	19.6	8.2	8.6	14.5	126	90

New Variety Releases - SV88083-4

Background

The advanced breeding line, SV88083-4, is to be released as a new variety for hay production. It was selected from the cross, MIOLRP 86-3/ Echidna// Wallaroo and lines were promoted from the stage 3 grain trial to the stage 4 hay trial in 1995 on the basis of improved disease resistance and increased hay production. Dry matter production, grain yield, disease resistance, and hay quality were evaluated from 1995 to 2000. SV88083-4 was maintained in the stage 4 trials because of increased dry matter production coupled with CCN resistance and tolerance and stem nematode tolerance.

Hay and Grain Yield

SV88083-4 is adapted to low, medium, and high rainfall locations. Table 29 shows the hay yields by rainfall region for all trials in South Australia and Victoria from 1995 to 2000. SV88083-4 consistently yielded more dry matter production in the three rainfall zones than the comparable check, Marloo. SV88083-4 yielded 3% higher than Marloo in low rainfall zones, 5% higher in medium rainfall zones and 11% higher in high rainfall zones. Averaged over all rainfall zones, it is an 8% improvement in hay yield compared to Marloo.

Table 29. Average hay yield in kg/ha for varieties grown in South Australia and Victoria in three rainfall zones from 1995 to 2000.

Variety	Rainfall zones			All Zones
	<375 mm	375-500 mm	>500 mm	
SV88083-4	5519	10203	14714	10545
Bettong	5176	9294	13667	9730
Marloo	5336	9685	13286	9739
Wallaroo	5170	9148	13213	9506
Number of trials	19	14	22	53

The grain yield of SV88083-4 was 10% higher than Marloo in the low rainfall zone, 15% higher in the medium rainfall zone and 8% higher in the high rainfall zone.

Table 30. Average grain yields (kg/ha) from trials grown in South Australia and Victoria from 1995 to 2000.

Variety	Rainfall zone		
	<375 mm	375-500 mm	>500 mm
SV88083-4	1622	2070	2883
Bettong	1400	1856	2661
Marloo	1476	1803	2681
Wallaroo	1557	1498	3076
Number of trials	20	11	22

Agronomic Characters

SV88083-4 is tall in stature averaging 4cm taller than Marloo. It is a midseason line, similar to Marloo to head and less susceptible to lodging than Marloo and Wallaroo. The shattering susceptibility, early vigour and stem diameter of SV88083-4 is similar to Marloo and Wallaroo. Table 31 shows the average plant height, zadoks growth stage, lodging susceptiblity, stem diameter, early vigour, and shattering susceptiblity for SV88083-4 compared to check varieties.

Plant varieties and breeding lines show differences for brown leaf tips caused by hot northerly winds. SV88083-4 resists brown leaf tips in these conditions whereas Marloo shows a high degree of brown leaf material.

Table 31. Average plant height, straw strength, and shattering potential in varieties grown in South Australia and Victoria from 1996 to 2000.

Variety	Height cm	Zadoks growth stage	Lodging %	Stem diameter (mm)	Early vigour[1]	Shattering number of grains/m^2
SV88083-4	92	62	14	6.8	4.2	58
Bettong	84	64	10	5.7	6.4	93
Marloo	88	64	33	6.5	4.0	55
Wallaroo	85	69	35	6.2	3.9	54
No. sites	33	24	21	3	14	12

[1] Early vigour is scored on a 1-9 scale where 1 is fast and 9 is slow.

Disease Reactions

SV88083-4 is resistant and tolerant to CCN and tolerant to stem nematode. It is moderately resistant to septoria and barley yellow dwarf virus. SV88083-4 is susceptible to stem rust and leaf rust. Tables 32 and 33 show the disease reactions.

Table 32. Stem rust, leaf rust, and barley yellow dwarf virus reactions in five hay varieties and lines grown in South Australia and Victoria.

Variety	Stem rust[1]	Leaf rust[1]	BYDV[2]
	Field	Field	Field
SV88083-4	S	S	MR
Bettong	MS	R	MS
Marloo	S	S	MS
Wallaroo	S	S	MS

[1] Disease reactions where R= resistant, MR=moderately resistant, MS=moderately susceptible, S= susceptible, VS=very susceptible

[2] Field results were provided by the National Rust Program, the University of Sydney. The field trial was artificially inoculated with the barley yellow dwarf virus.

Table 33. Septoria, bacterial blight, CCN, and stem nematode disease reactions in four hay varieties grown in South Australia and Victoria.

Variety	Septoria[1]	CCN R[1]	CCN T[2]	Stem nematode[2]
SV88083-4	MR	R	MT	T
Bettong	MS	R	I	T
Marloo	MS	R	MT	MT
Wallaroo	S	R	MT	MI

[1] Disease reactions where R= resistant, MR=moderately resistant, MS=moderately susceptible, S= susceptible, VS=very susceptible

[2] T=tolerant, MT= moderately tolerant, MI=moderately intolerant, I=intolerant

Hay Quality

SV88083-4 is 1% superior when compared to Wallaroo for digestibility, but 1% lower than Marloo. The average crude protein is 2% higher than Wallaroo, but 6% lower than Marloo (Table 34).

Table 34. Average hay chemical quality characters from trials grown in South Australia and Victoria from 1995 to 1999.

Variety	Crude protein % dm	Digestibility % DDM	Metabolisable energy MJ/kg dm
SV88083-4	9.2	63.0	9.1
Bettong	9.8	62.8	9.2
Marloo	9.8	63.6	9.2
Wallaroo	9.0	62.4	8.9
Number of trials	31	31	25

Grain Quality

Hectolitre weight for SV88083-4 was similar or better than Marloo and Wallaroo. Screenings percent and 1000 grain weight was slightly better when compared to Marloo and Wallaroo. Protein and oil percent was similar to Marloo and lower than Wallaroo. Table 35 shows the physical and chemical grain quality characters.

Table 35. Average physical and chemical grain quality characters for grain grown in South Australia and Victoria from 1997 to 2000.

Variety	Hectolitre weight kg/hl	1000 grain weight g	Screenings %<2 mm	Protein %	Oil %
SV88083-4	50.2	34.1	7.9	11.9	6.5
Bettong	50.1	35.6	4.6	12.1	5.2
Marloo	49.2	32.8	12.1	11.7	6.3
Wallaroo	48.2	32.1	13.3	11.4	7.1
No. sites	39	26	40	36	36

New Variety Releases - SV87103-109

Background

The advanced breeding line SV87103-109 is being considered for release as a new variety for hay production. SV87103-109 was selected from the cross Dumont/ Wallaroo// Bandicoot. This line was promoted from the stage 3 grain trial to the stage 4 hay trial in 1995 on the basis of improved disease resistance. Dry matter production, grain yield, disease resistance, and hay quality were evaluated from 1995 to 2000. SV87103-109 was maintained in the stage 4 trial due to moderate resistance to stem rust, resistance and tolerance to CCN, and consistently higher digestibility than current midseason oat varieties, such as Marloo.

Hay and Grain Yield

SV87103-109 is adapted to low, medium, and high rainfall locations. Table 36 shows the hay yields by rainfall region for all trials in South Australia and Victoria from 1995 to 2000. SV87103-109 averages 2% higher dry matter yields when compared to Marloo across all rainfall zones.

Table 36. Average hay yield in kg/ha for varieties grown in South Australia and Victoria in three rainfall zones from 1995 to 2000.

Variety	Rainfall zones			All zones
	<375 mm	375-500 mm	>500 mm	
SV87103-109	5513	9832	13760	9903
Bettong	5336	9294	13708	9711
Marloo	5519	9685	13320	9735
Wallaroo	5170	9148	14514	9486
Number of trials	19	14	21	53

SV87103-109 yielded 92% and 90% of Wallaroo in the low and medium rainfall zones, but was similar to Wallaroo in the high rainfall zones. It yielded 97% and 99% of Marloo in low and medium rainfall areas but was 16% higher yielding in high rainfall areas for grain production (Table 37).

Table 37. Average grain yields (kg/ha) from trials grown in South Australia and Victoria from 1995 to 2000.

Variety	Rainfall zone		
	<375 mm	375-500 mm	>500 mm
SV87103-109	1424	1786	3098
Bettong	1400	1856	2661
Marloo	1476	1803	2681
Wallaroo	1557	1978	3076
Number of trials	20	11	22

Agronomic Characters

SV87103-109 is tall in stature measuring about 2 cm shorter than Marloo. It is similar in flowering time to Marloo and less susceptible to lodging than Marloo and Wallaroo. SV87103-109 tends to be higher for shattering susceptibility than all other lines and varieties in the comparison (Table 38).

The stem diameter of SV87103-109 is similar to Marloo and Wallaroo and early vigour is intermediate between Marloo and Bettong (Table 38).

Table 38. Average plant height, stem diameter, straw strength, growth stage, early vigour and shattering potential in varieties grown in South Australia and Victoria from 1996 to 1998 (data for stem diameter is for the period 1997-2000).

Variety	Height cm	Stem diameter mm	Lodging %	Zadoks growth stage	Early Vigour[1]	Shattering no. grains/m^2
SV87103-109	87	6.5	31	63	4.4	101
Bettong	82	5.7	12	63	6.0	82
Marloo	89	6.5	43	63	2.9	50
Wallaroo	84	6.2	42	69	3.3	62
No. sites	22	3	14	13	5	5

[1] Early vigour is rated on a 1-9 scale where 1 is fast and 9 is slow.

Disease Reactions

SV87103-109 is moderately resistant to stem and leaf rust, resistant and moderately intolerant to CCN, and intolerant to stem nematode (Table 39). It is moderately susceptible to septoria (Table 40).

Table 39. Stem rust, crown rust, and barley yellow dwarf virus reactions in five hay varieties and lines grown in South Australia and Victoria.

Variety	Stem rust[1]	Leaf rust[1]	BYDV[2]
	Field	Field	Field
SV87103-109	MR/MS	MR	MS
Bettong	MS	R	MS
Marloo	S	S	MS
Wallaroo	S	S	MS

[1] Disease reactions where R= resistant, MR=moderately resistant, MS=moderately susceptible, S= susceptible, VS=very susceptible

[2] Field results were provided by the National Rust Program, the University of Sydney. The field trial was artificially inoculated the barley yellow dwarf virus.

Table 40. Septoria, bacterial blight, CCN, and stem nematode disease reactions in four hay varieties grown in South Australia and Victoria.

Variety	Septoria[1]	CCN R[1]	CCN T[2]	Stem nematode[2]
SV87103-109	MS	R	MI	I
Bettong	MS	R	I	T
Marloo	MS	R	MT	MT
Wallaroo	S	R	MT	MI

[1] Disease reactions where R= resistant, MR=moderately resistant, MS=moderately susceptible, S= susceptible, VS=very susceptible

[2] T=tolerant, MT= moderately tolerant, MI=moderately intolerant, I=intolerant

Hay Quality

SV87103-109 is 2% better than Marloo and 4% better than Wallaroo for digestibility (Table 41). Crude protein is intermediate between Marloo and Wallaroo.

Table 41. Average hay chemical quality characters from trials grown in South Australia and Victoria from 1995 to 1999.

Variety	Crude protein % dm	Digestibility %	Metabolisable energy MJ/kg dm
SV87103-109	9.4	65.0	9.4
Bettong	9.8	62.8	9.1
Marloo	9.8	63.6	9.2
Wallaroo	9.0	62.4	8.9
Number of trials	31	31	22

Grain Quality

Hectolitre weight for SV87103-109 was similar or better than Marloo and Wallaroo (Table 42). Screenings percent was slightly better when compared to Marloo and Wallaroo but grain size was slightly smaller. Protein and oil are similar to Marloo.

Table 42. Average physical and chemical grain quality characters for grain grown in South Australia and Victoria from 1995 to 2000.

Variety	Hectolitre weight kg/hl	1000 grain weight g	Screenings %<2 mm	Protein %	Oil %
SV87103-109	48.9	31.1	9.4	11.9	6.1
Bettong	50.0	35.5	4.7	12.1	5.2
Marloo	48.9	32.9	12.3	11.7	6.3
Wallaroo	48.0	32.0	13.5	11.4	7.1
No. sites	37	25	39	36	36

Recommendations

- Continue to source germplasm worldwide to improve oat varieties for hay end use.
- Increase the number of sites for evaluating stage 4 hay trials, so less time is required to identify advanced breeding lines for variety release.
- As the populations developed for hay end use increase in the early generations, more labour resources will be needed to handle selection effectively.
- Characterise genetic variability in diverse germplasm for quality characters associated with preference and incorporate in crossing program.
- Develop calibrations for the hay probe, so non-destructive assessment of dry matter production is possible in stage 1, stage 2, and stage 3 experiments.
- Strengthen linkages with industry research projects.
- Develop collaborative research projects with other organisations involved with hay variety development.

Appendices

OAT VARIETY NOTES AND PERFORMANCE

Milling Varieties

Echidna
(long term state average trial yield, 3.08 t/ha; 2000, 2.86 t/ha with good yields in all districts*)*

Echidna is a widely adapted high yielding, dwarf variety used for both milling and feed end uses. Although Euro and Mortlock have superior quality characters, Echidna is accepted as a milling variety. Echidna is suited to areas that do not have CCN or stem rust.

Euro
(long term state average 14% below Echidna; 2000, best performance was in the EP where yields were 3% less than Echidna)

Euro maintains good hectolitre weight and low screenings in marginal production areas. Euro is resistant, but intolerant to CCN. When grown in the presence of CCN yield is reduced, but quality is only slightly affected. Euro is also very susceptible to stem rust, which was prevalent in 2000. Grain quality was significantly affected by stem rust. Euro is a high quality, tall milling variety adapted to areas where stem rust is not a problem.

Mortlock
(long term state average, 21% below Echidna; 2000, 15% below Echidna across the state with yields less than the site mean at all sites)

When stem rust is present, Mortlock has reduced yields due to moderate susceptibility to stem rust. However, grain quality is less affected when compared to Euro. Mortlock has the highest grain protein of the milling oat varieties. It is moderately susceptible and intolerant to CCN. Mortlock is a high quality, tall milling variety that is generally outclassed by Euro except in the presence of stem rust.

Pallinup
(long term state average, 12% below Echidna; 2000 not trialed)

Pallinup is a tall milling variety released from WA in 1994. It yields similar or slightly less than Euro in most districts. Pallinup has lower hectolitre weight and more screenings than Euro, especially in low rainfall areas and in CCN affected soils. Although Pallinup is moderately susceptible to stem rust, quality characters are less affected than Euro in the presence of stem rust. Pallinup is suited to higher rainfall areas where CCN and stem rust is not a problem.

Coomallo
(long term state average, 16% below Echidna; 2000 not trialed)

Coomallo is a high quality, tall milling variety released from WA in 1996. Hectolitre weight is lower and screenings % is slightly higher than Euro, especially in the presence of CCN. The variety generally yielded more than Euro in the South East, Kangaroo Island, and the Murray Mallee, but yielded less than Euro in the Yorke Peninsula and the Mid North in 1997.

Hotham
(long term state average, 14% below Echidna; 2000 not trialed)

Hotham, a milling variety, is an intermediate tall, similar in height to Euro. It was released by Agriculture WA in 1997. Hotham was tested for two years in SA trials. It is an early variety with an average hectolitre weight similar to Euro, but slightly more screenings. Hotham is resistant, but intolerant to CCN. It is very susceptible to stem rust. Hotham is suited to areas where an early milling oat is desired and stem rust is not a problem.

91024-7
(long term state average, 3% below Echidna; 2000, 7% higher than Echidna across the state with greatest adaptation in the YP, Mid North, Adelaide Hills, SE, and the lower EP)

91024-7 is a dwarf milling line expected to be released in 2003. It is adapted to the medium and high rainfall areas of southern Australia. The long term yield average for 91024-7 is 11% higher than Euro. Hectolitre weight, groat percent, and screenings percent are similar to Euro. 91024-7 is moderately susceptible to stem rust, resistant to leaf rust, and moderately resistant to septoria. It is moderately susceptible to bacterial blight.

Feed Varieties

Echidna
(long term state average trial yield, 3.08 t/ha; 2000, 2.86 t/ha with good yields in all districts*)*

(See description under milling varieties)

Quoll
(long term state average equal to Echidna; 2000, 4% better than Echidna across the state and 20% higher yielding in the Adelaide Hills, and the South East)

Quoll is a high yielding dwarf feed variety that was developed by SARDI and commercialised by SGB. Seed was available in 1999. Quoll yields similar to Echidna in the absence of stem rust, but significantly more than Echidna when stem rust is widespread as in 2000. Quoll has 1.5% higher protein and 2.5% higher grain digestibility than Echidna. Hectolitre weight was higher for Quoll than Euro and Echidna in the South East 2000 trials due to stem rust resistance. Quoll is resistant to stem and leaf rust, tolerant to stem nematode, and moderately resistant to barley yellow dwarf virus. It is susceptible and intolerant to CCN. Quoll will replace Echidna in medium and high rainfall areas prone to stem rust infection where CCN is not present. Seed is licensed to SGB Australia

Potoroo
(long term state average 1% lower than Echidna; 2000, 4% lower than Echidna across the state, with 7% higher yields than Echidna in the Murray Mallee.

Potoroo is a high yielding grain variety with both resistance and tolerance to CCN. However, due to low hectolitre weight and high screenings percent, Potoroo is not a milling class variety. Potoroo is a widely adapted dwarf feed oat variety suited to regions infested with CCN.

Wandering
(No long term state average and not tested in 2000; 1999 2% less than Echidna)

Wandering is a new feed oat variety released by Agriculture WA in 1999. It was commercialised by Agracorp. Wandering is a tall dwarf variety with early/midseason maturity. It is susceptible and intolerant of CCN and intolerant of stem nematode. It is susceptible to stem and leaf rust and moderately susceptible to BYDV. More information about feed quality in comparison to Quoll will be available later in the year.

Naked Varieties

Numbat

(long term state average 1.98t/ha, 2000 not tested)

Numbat is a naked oat variety developed by SARDI and released as a public variety. The harvested product has no husk, resulting in a high energy food for pig and poultry rations. Numbat is susceptible to CCN and stem nematode. Numbat is suited to medium and high rainfall areas, particularly the Lower Eyre Peninsula, where CCN is not present. Seed is not protected by PBR and freely available in 1999

Hay Varieties

Marloo
(2000 average hay production 13.2t/ha, 1995-2000 average hay production 9.7 t/ha)

Marloo is a tall variety with CCN resistance and tolerance. Marloo is widely adapted as a hay variety in most areas, but particularly where CCN is present.

Wallaroo
(2000 average hay production 13.4t/ha,1995-2000 average hay production 9.5 t/ha)

Wallaroo is a tall, early variety with CCN resistance and tolerance. It is 7 to 10 days earlier than Marloo. Wallaroo is adapted as a hay variety to areas where an early variety with CCN resistance and tolerance is desired.

Glider
(2000 average hay production 12.9t/ha,1995-2000 average hay production 10.2 t/ha)

Glider is a variety released jointly by SARDI and Texas A&M University as a late-maturing hay variety. Glider has excellent foliar disease resistance, but is susceptible and intolerant to CCN. Glider is resistant and tolerant to stem nematode. It heads two weeks later than Marloo and Bettong and three weeks later than Wallaroo. Glider is adapted to high rainfall areas where CCN is not present. Seed is available from AFCA.

Vasse
(2000 not trialed. Average hay production in 1997 was 9.13t/ha compared to Marloo 9.20t/ha and Glider 8.48t/ha)

Vasse is a semi-dwarf hay oat variety developed by Agriculture, WA and commercialised by Paramount Seeds. It is almost two weeks later to head than Marloo and four days earlier than Glider. Hay yields were evaluated for three years and Vasse was similar to Marloo. Vasse is susceptible and intolerant to CCN and intolerant to stem nematode.Vasse is a late maturing hay variety susceptible and intolerant to CCN, stem nematode, and many foliar diseases.

Eurabbie
(2000 average hay production 12.9t/ha, 1997-2000 average hay production 10.3t/ha, Marloo 9.8t/ha)

Eurabbie is a dual purpose dwarf oat released by Agriculture NSW for grazing and feed grain production. Eurabbie is two to three days later than Marloo. Eurabbie is suited to higher rainfall areas for hay production where CCN is not present. Grain quality is poor. It is moderately susceptible and moderately intolerant of CCN, moderately susceptible to stem rust, susceptible to leaf rust and moderately intolerant of stem nematode.

Gwydir
(2000 not trialed. 1998 average hay production 9.12t/ha compared to Marloo at 9.19t/ha and Glider at 9.99t/ha)

Gwydir is a grazing variety released by Pacific Seeds in 1998. It is protected by PBR. It is a late maturing variety similar to Glider in cutting time. It is resistant to stem and leaf rust, susceptible and intolerant of CCN, and intolerant of stem nematode. It is lodging and shattering susceptible and has early vigour similar to Bettong.

Warrego
(2000 average hay production 12.9 t/ha. 1998 and 2000 average hay production 11.2 t/ha compared to Marloo at 11.2 t/ha and Glider at 11.5 t/ha)

Warrego is a grazing variety released by Pacific Seeds in 1998. It is protected by PBR. It is a late maturing variety similar to Glider in cutting time. It is resistant to stem and leaf rust, susceptible and intolerant of CCN, and intolerant of stem nematode. It is lodging and shattering susceptible and has early vigour similar to Bettong.

Bass
(2000 not trialed. 1998 and 1999 average hay production 10.6 t/ha compared to Glider at 10.9t/ha)

Bass was released by the Tasmanian Department of Agriculture in 1998. Bass is a late maturing variety, similar to Glider in cutting time. It is a lodging susceptible variety with early vigour slightly worse than Glider. Bass is very susceptible and intolerant to CCN, moderately susceptible to stem rust, very susceptible to leaf rust, moderately susceptible to BYDV, and intolerant of stem nematode. Bass is a potential replacement for areas that grow Esk and Nile.

Targa
(2000 not trialed. 1998 and 1999 average hay production was 11.6t/ha compared to Glider at 10.9 t/ha)

Targa was released by the Tasmanian Department of Agriculture in 1999. Targa is a late maturing variety which is later to head than to Glider. It has slow early vigour and is lodging susceptible. It is resistant and intolerant of CCN, susceptible to stem rust and very susceptible to leaf rust. Targa is also moderately susceptible and intolerant of stem nematode and moderately susceptible to BYDV. Despite the disease susceptibility, Targa performed well for dry matter production in the two years tested and is a potential replacement for areas that grow Esk and Nile.

Riel
(2000 not trialed. 1996 average hay production 9.24t/ha compared to Marloo at 10.09t/ha and Glider at 10.48t/ha)

Riel is a Canadian variety released by Queensland DPI in 1993. It is protected by PBR. Riel is a late maturing, tall forage variety similar to Glider in cutting time. It is moderately resistant and intolerant of CCN and intolerant of stem nematode. Riel is susceptible to stem rust, resistant to leaf rust, and moderately resistant to BYDV.

88083-4

(2000 average hay production 14.0t/ha, 1995-2000 average hay production 10.5 t/ha compared to Marloo 9.7 t/ha)

88083-4 is a tall midseason line similar to Marloo for early vigour and heading. It resists brown leaf tipping by hot northerly winds. 88083-4 is resistant and tolerant to CCN and tolerant to stem nematode. It is moderately resistant to septoria and barley yellow dwarf virus, but susceptible to stem and leaf rust. 88083-4 is adapted to low, medium, and high rainfall locations.

87103-109

(2000 average hay production 13.5t/ha, 1995-2000 average hay production 9.9 t/ha compared to Marloo 9.7 t/ha)

87103-109 is a tall line about three to four days earlier than Marloo. It is similar to Marloo for early vigour. 87103-109 is moderately susceptible to stem rust and moderately resistant to leaf rust. It is resistant and moderately tolerant to CCN, and intolerant to stem nematode. 87103-109 has consistently higher digestibility than current midseason oat varieties. 87103-109 is adapted to low, medium, and high rainfall sites.

93072-43

(2000 average hay production 13.7t/ha, 1998-2000 average hay production 11.2 t/ha compared to Marloo 10.4 t/ha)

93072-43 is a tall midseason advanced breeding line with good early vigour. It is resistant to CCN and moderately tolerant to CCN and stem nematode. 93072-43 is also resistant to leaf rust and barley yellow dwarf virus. It is moderately resistant to stem rust.

Reference

Mackie, M. 2000. Australian Fodder Industry Export Market Outlook. P.10-11. In Fodder Feed for the Future. Annual Australian Fodder Industry Association Conference. 7-8 September 2000. Victorian Institute of Animal Science, Attwood, Victoria.