

2020 SOUTH AUSTRALIAN CROP SOWING GUIDE



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CORPORATION

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DECEMBER 2019



**ARE YOU GROWING THE BEST
VARIETY FOR YOUR SITUATION?**

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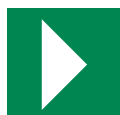
PHOTO: Sarah Day, SARDI Crop Sciences, Clare

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This guide can be downloaded to your computer or tablet at:
www.grdc.com.au/NVT-south-australian-crop-sowing-guide
Remember to update it each November.

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THE SOUTH AUSTRALIAN CROP SOWING GUIDE

The *South Australian Crop Sowing Guide* outlines information on current varieties of the major winter crops suitable to be grown in South Australia to assist growers in making decisions on variety selection for the upcoming season.

This edition of the *SA Crop Sowing Guide* has been compiled by officers within the South Australian Research and Development Institute (SARDI).

It is proudly sponsored by the South Australian Grain Industry Trust in association with Primary Industries and Regions SA and the Grains Research and Development Corporation.

The SARDI Crop Sciences Division officers acknowledge the sponsorship of this guide by the SA Grain Industry Trust (SAGIT) and the Grains Research and Development Corporation (GRDC), the contributions of agronomy and oat breeding and vetch breeding research staff in SA, as well as collaborators around Australia in producing results published in this edition.

Editor: Phil Davies, SARDI, Crop Sciences



SA grain growers funding research solutions

The South Australian Grain Industry Trust annually invests more than \$1.5 million to research and development projects across the industry, from growing, farming systems, soil management, nutrition, harvesting, storage, processing and marketing and extension of information to growers.

In 2019, SAGIT has invested in the following projects:

- 2019 Ag Excellence Forum & Awards, Ag Excellence Alliance
- A genetic, environmental and functional; investigation of late maturity alpha-amylase (LMA) and its implications for wheat breeding, University of Adelaide
- Agronomic and quality analysis of high protein malt barley in SA, SARDI
- Comparative effects of agricultural pesticides on SA soil microbial functions, University of South Australia
- Conversations with farmers: Agricultural Practice change with the PA early adopters, Society of Precision Agriculture Australia
- Copper management for the future, LEADA
- CSI: Crop Science Investigators, AgCommunicators
- Deep ripping to enhance production on Mallee sandy soils, Mallee Sustainable Farming
- Developing new capability for research on Rhizoctonia, SARDI
- Development of a probe for continuous measurement of soil nitrate, University of Adelaide
- Development of dual purpose awnless wheat varieties for frost management, LongReach Plant Breeders
- Enhanced N-use efficiency in durum through improved genetics, University of Adelaide
- Establishing current levels of salt tolerance in Australian bread wheats, SARDI
- Field testing of sodicity and salinity-tolerant oat varieties, University of Adelaide
- Grain research internships, SARDI
- Grower crop root health workshops, SARDI
- Herbicide residue effects on soil microbial communities in alkaline soils, University of Adelaide
- Identifying nutrient requirements of lentils and chickpeas grown in Mallee sands, Mallee Sustainable Farming
- Improved capture of native soil nitrogen and urea fertiliser in wheat, CSIRO Agriculture and Food
- Improved crop nutrition for disease management and reduced fungicide dependency, SARDI
- Improved phosphorus prescription maps - beyond replacement P, Trengove Consulting
- Improved soil water decisions across the S.E. cropping region, MacKillop Farm Management Group Inc
- Improving monitoring and management of etiology in lentils, SARDI
- Improving productivity of oats, SARDI
- Improving the early management of dry sown cereal crops, SARDI
- Increasing reliability of lentil production on sandy soils, Trengove Consulting
- Increasing the knowledge and understanding of micronutrient deficiency in the Upper North, Upper North Farming Systems
- Investigating frost susceptibility in Clearfield varieties treated with imidazolinone herbicide, Mallee Sustainable Farming
- Long-term cropping systems trial, Hart Field-Site Group
- MacKillop Farm Management Group annual trial results book, MacKillop Farm Management Group
- National Soil Judging Competition, Soil Science Australia (SA)
- Novel Plant growth-promoting bacteria from Australian soil biodiversity: evaluation, understanding and application, University of Adelaide
- Optimising P nutrition in pulses to maximise N fixation and yield, Agronomy Solutions
- Phenotypic evaluation of a wheat RIL population for salinity tolerance, University of Adelaide
- Profitable pulses for the Murray Plains, Murray Plains Farmers
- Promoting secondary and tertiary student engagement in crop production, AgXtra
- Publication of the 2020 Farm Gross Margin Guide for SA, PIRSA Rural Solutions SA
- Rapid development of innovative lentils for low rainfall regions, Global Grain Genetics
- Regional internship in applied grains research, Hart Field-Site Group
- Revealing the basis for head-loss in barley, University of Adelaide
- Rhizosphere 5 International Conference in Saskatoon Canada, University of South Australia
- SA Crop Variety Sowing Guide, SARDI
- SA HRZ canola variable rate nitrogen prescription project, Elders Rural Services
- Saline field evaluation of a wheat population identifying novel salinity tolerance, University of Adelaide
- Seed priming to improve South Australian crop germination, SANTFA
- Soil water and temperature thresholds for early wheat establishment, CSIRO
- Spading header rows for grass control, improved yields and soil protection, Insight Extension for Agriculture
- Strategies to enhance the value of on-farm grain storage in South Australia, University of South Australia
- Strategies to enhance the value of on-farm grain storage in South Australia, CSIRO
- Supporting premier PA events: Precision Ag EXPOS and Symposiums, SPAA
- Survey potential emerging pulse root diseases, SARDI
- Swathing for barley grass weed seed collection and applying drone technology, SARDI
- Uniform seed distribution along the row to increase yields and reduce seed costs, Northern Sustainable Soils
- Upper North Barley time of sowing; frost / heat stress effects, Upper North Farming Systems

INTRODUCTION

NATIONAL VARIETY TRIALS (NVT)

The variety trial results presented in this book are sourced from the NVT program, the National Oat Breeding Program and the National Vetch Breeding Program.

NVT provide independent information on varieties for growers. The aim of each NVT is to document a ranking of new and widely adopted varieties in terms of grain yield and to provide grain quality information relevant to delivery standards. NVT are also used by pathologists to determine disease resistance ratings used in the Sowing Guide.

Conducted to a set of predetermined protocols, variety trials are sown and managed as close as possible to local best practice such as sowing time, fertiliser application, weed management and pest and disease control, including fungicide application. NVT are not designed to grow varieties to their maximum yield potential.

It is acknowledged that an ongoing project of this type would not be possible without the cooperation of growers prepared to contribute sites, and who often assist with the management of trials on their property.

PLANT BREEDER'S RIGHTS (PBR)

Varieties subject to Plant Breeder's Rights at the time of printing are annotated with the symbol (b). It should be noted that 'Unauthorised commercial propagation or any sale, conditioning, export, import or stocking of propagation material of these varieties is an infringement under the *Plant Breeder's Rights Act 1994*. Intentional infringement of a PBR attracts a penalty of \$85,000 for individuals. The penalty for corporations is up to five times greater.

END POINT ROYALTIES (EPRS)

EPRs payable for 2019-20 are quoted from www.varietycentral.com.au and are quoted ex GST. Compliance with EPR systems is vital to ensure the future of the Australian grains industry through the funding of new varieties and long-term productivity gains. EPRs for 2020-21 harvest will become available early in 2020 on the Variety Central website.

INTERPRETING LONG-TERM YIELD DATA

The long-term yield data presented in the Sowing Guide is an output of NVT Long Term Multi Environment Trial (MET) analysis. NVT run trials in all cropping regions of Australia (e.g. Lower Eyre Peninsula, Mid North, Murray Mallee etc) and use a five-year rolling dataset in the MET analysis.

Historically, NVT used a variance component analysis model to produce long-term yield predictions on a regional 'mean' basis. In Australia, this model has been found to be inadequate in modelling Variety by Environment interaction (GxE) and reporting at a regional level often masked important GxE interactions. This meant that good and bad years were 'averaged' together, making it difficult to understand the strengths and weaknesses of each variety when trialled in different environments.

Now, a factor analytic (FA) mixed model approach is used in the MET analysis using expertise from the GRDC-supported Statistics for the Australian Grains Industry (SAGI) program. This approach generates long-term MET predictions for varieties at an individual trial level. A prediction is generated for every variety in every trial in the entire dataset, regardless of whether the variety was actually tested at every location. Using the FA model, NVT can provide a yield prediction for every situation. For instance, if the yields of five varieties were ranked in a similar order at multiple trials (sites A, B, C and D), but variety X was not grown at site D, the relative ranking of X against the other varieties can be used to predict the yield of variety X at site D.

The output used in this sowing guide presents the MET data on a region-by-year basis across the five years used in the MET dataset. The analysis, and subsequent reporting systems, have allowed NVT to bring together very large data sets and make more refined, relevant and robust predictions about the relative performance of each variety across different locations and seasons. Readers can now use this more detailed data to better understand a variety's performance over several years – rather than just a single averaged value.

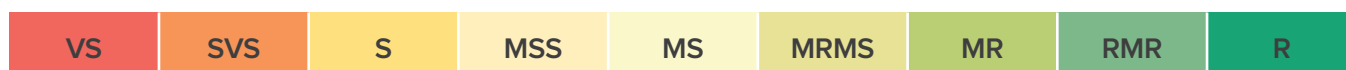
Readers can further interrogate the data online to better understand the performance of varieties under a range of situations using the NVT Long Term Yield Reporting Tool. The FA method is a very powerful and accurate predictor of performance, and the yield predictions are best viewed at the individual trial/environment level. However, these detailed datasets are too large for printed sowing guides or quick reference summaries, such as the Sowing Guide. NVT have developed a system for viewing the complex dataset based on individual user preferences. Users can choose to view data in Year or Yield-based groupings and can tailor site or region selections to their own needs, for instance by viewing METs only for sites where varieties were present in the trials (default option). In the SA Sowing Guide, we present results in year groupings and only for varieties present in trials. The NVT Long Term Yield Reporting Tool is designed to run on all web browsing platforms on computers, tablets and phones, and is available online at <https://app.nvtonline.com.au>.

LEGEND: MEAN VARIETY YIELD PERFORMANCE



Long-term mean yield illustrated by colour gradient from lowest (red) to highest (green)

LEGEND: DISEASE RESISTANCE RATING



Disease severity scale from very susceptible (VS) to resistant (R)

WHEAT

By Kenton Porker, Melissa McCallum, Courtney Peirce, Phil Davies,
Tara Garrard and Hugh Wallwork, SARDI Crop Sciences

Since publication of the 2019 sowing guide, there have been several new releases. The slightly slower developing milling wheat varieties Catapult[®] and RockStar[®] have been added to the list. The sowing guide continues to include the introduction of selected winter wheats and feed wheats. Three new durum varieties, DBA Artemis[®], Bitalli[®] and Westcourt[®] have also been recently released. Other more recent releases including Vixen[®], Clearfield varieties Sheriff CL Plus[®] and Razor CL Plus[®] have now been widely evaluated in the National Variety Trials (NVT), and longer term SA grain yield data is provided within this publication.

Information on the most important selection criteria, grain yield, quality, developmental speed and disease resistance for each variety can be found in this guide with a summary in Table 1. While the varieties listed are considered likely to provide the best return within each quality grade, growers need to consider their individual farm and paddock situation and make their selection based on all available information.

DOMESTIC FLOUR MILLERS WHEAT VARIETY PREFERENCES

Most of South Australia's wheat is exported to the Middle East for flat and pan bread production, and to a lesser extent noodle production. The domestic flour millers purchase a small proportion of South Australian wheat either from marketers or directly from growers. The domestic flour millers may have different quality requirements to export markets due to different end products and processes employed. For further information, contact Laucke Flour Mills (03 5431 5201).

AGRONOMY

Varieties differ in developmental speed. It is important to match variety development with sowing time since flowering time is critical for wheat

yield. Growers need to understand the optimal flowering periods for their environment. The optimal flowering period is a compromise between frost risk, moisture stress, and heat stress events, and differs from region to region. The majority of widely adapted fast to medium-developing wheat varieties are suited to early May to mid-May sowing. There are a growing number of varieties currently being evaluated that may offer potential for mid to late-April sowing; however, these need wider evaluation. The majority of long-term data generated from NVT results presented in this publication are derived from commercially relevant May sowing dates. Extensive state-wide evaluation within NVT over coming seasons will provide more confidence in varieties that may have specific adaptation requirements. Figure 1 illustrates the range of developmental speeds of mid-season wheats sown during the period from May to June across SA NVT in 2018.

DISEASE

Growers should note that a number of the newer varieties listed in this guide are below acceptable industry standards for rust resistance but offer other important or useful attributes. If grown, these varieties should be accompanied by suitable rust-preventative strategies. Where varieties do not meet minimum disease resistance standards for rust, as set by industry, they are listed with a cautioning note. The current status of selected early to mid-season wheat varieties is shown in Table 2; longer season wheat ratings are shown in Table 9 and durum wheat in 12. The full SARDI Cereal Variety Disease Guide should always be consulted when selecting varieties and can be found at: http://pir.sa.gov.au/research/services/reports_and_newsletters/crop_performance.

An updated version with 2019 data will be available from mid-February.

TABLE 1 Suitable wheat varieties for planting in South Australia.

| Variety and current max. grade | Suitability and significant features |
|-----------------------------------|---|
| HARD (AH) | |
| Beckom ^{db} | Low to medium rainfall districts. |
| Catapult ^{db} | All districts broad adaptation, wheat on wheat option, development pattern suited to late April to early May sowing, but limited evaluation in SA. |
| Emu Rock ^{db} | Low to medium rainfall districts, very fast development speed. |
| Grenade CL Plus ^{db} | All districts, imidazolinone tolerant. |
| Illabo ^{db} | Mid winter wheat, very early sowing (pre-April 20) and grazing opportunity in medium to high rainfall zones. |
| LongReach Arrow ^{db} | All districts, similar yields to Mace ^{db} with shorter plant height, wheat on wheat option except that it is susceptible to Septoria tritici blotch. |
| LongReach Cobra ^{db} | Medium to high rainfall districts. |
| LongReach Havoc ^{db} | All districts, suited to wheat on wheat except that it is susceptible to Septoria tritici blotch. Susceptible to Stem rust. |
| LongReach Kittyhawk ^{db} | Mid winter wheat, very early sowing and grazing opportunity in medium to high rainfall zones. Good Septoria tritici blotch resistance. |
| LongReach Scout ^{db} | All districts, avoid wheat stubbles due to Yellow leaf spot susceptibility. Now outclassed. |
| RockStar ^{db} | All districts broad adaptation, wheat on wheat option except susceptible to Powdery mildew. Development pattern suited to late April – early May sowing, but limited evaluation in SA. |
| Scepter ^{db} | All districts broad adaptation, wheat on wheat option except that it is susceptible to Septoria tritici blotch and Powdery mildew. |
| Vixen ^{db} | All districts, fast development, similar yields to Scepter ^{db} , wheat on wheat option except that it is susceptible to Septoria tritici blotch. |
| APW | |
| Chief CL Plus ^{db} | All districts, imidazolinone tolerant, wheat on wheat option except that it is very susceptible Powdery mildew. |
| Cutlass ^{db} | All districts and early sowing situations. |
| LG Cobalt ^{db} | All districts, yields similar to Mace ^{db} . |
| LongReach Trojan ^{db} | Medium to high rainfall districts. |
| Sheriff CL Plus ^{db} | All districts, imidazolinone tolerant. Development speed similar to LongReach Trojan ^{db} , suited to wheat on wheat except that it is susceptible to Septoria tritici blotch. |
| ASW | |
| DS Bennett ^{db} | Slow winter wheat, very early sowing and grazing opportunity in medium to higher rainfall zones, awnless hay option. |
| Razor CL Plus ^{db} | All districts, imidazolinone tolerant, slightly higher yielding than Mace ^{db} . |
| SOFT | |
| LongReach Impala ^{db} | Soft wheat producing districts but very susceptible to Septoria tritici blotch and Leaf rust. |
| LongReach Orion ^{db} | Soft wheat producing districts. Awnless hay option. Useful resistance to Septoria (MRMS). |
| UNCLASSIFIED AND FEED | |
| Longsword ^{db} | Fast winter wheat, very early to May sowing and grazing opportunity in all districts. |
| LongReach Nighthawk ^{db} | Slow spring wheat, suited to pre 20 April emergence. Limited evaluation in NVT. |
| Manning ^{db} | High rainfall, winter wheat suited to long season districts especially the South East region. |
| RGT Accroc | Slow red winter wheat, very early sowing and grazing opportunity in medium to high rainfall zones. |
| RGT Calabro | Slow red winter wheat, very early sowing and grazing opportunity in medium to high rainfall zones. |
| Tenfour ^{db} | All districts. Susceptible to Stem rust and Powdery mildew and very susceptible to Stripe rust and Septoria tritici blotch. |
| Zanzibar ^{db} | Medium to high rainfall districts, more evaluation needed. Very susceptible to Stem rust. |
| DURUM | |
| Bitalli ^{db} | All durum districts, fast development speed. |
| DBA Artemis ^{db} | All durum districts. |
| DBA-Aurora ^{db} | All durum districts. |
| DBA Spes ^{db} | All durum districts. |
| DBA Vittaroi ^{db} | All durum districts, fast development speed. |
| Saintly ^{db} | All durum districts, fast development speed and potential for hay production (awnless). |
| Westcourt ^{db} | All durum districts. |

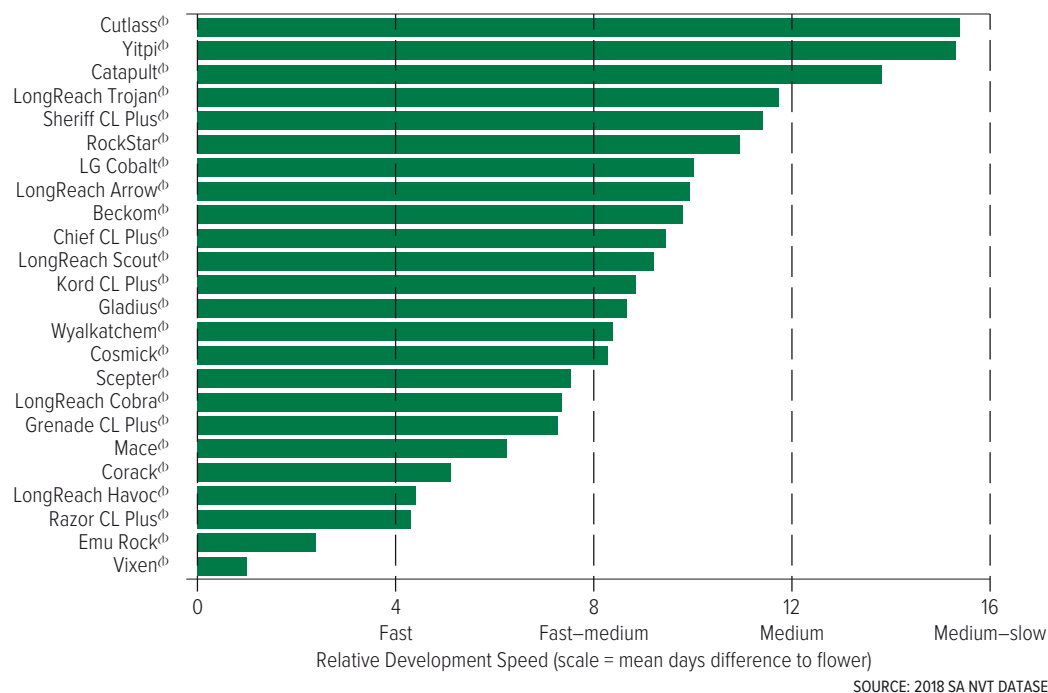


FIGURE 1 Relative speed of development of selected wheat varieties sown during May and June 2018 across SA. Varieties are ranked according to time to flower.

TABLE 2 Responses of wheat varieties to disease and Black point.

| Variety | Rust | | | Septoria tritici blotch | Yellow leaf spot | Powdery mildew | Black point | CCN |
|-----------------------------------|------|--------|------|-------------------------|------------------|----------------|-------------|------|
| | Stem | Stripe | Leaf | | | | | |
| Beckom ^{db} | MRMS | MRMS | MSS | S | MSS | MSS | MRMS | R |
| Catapult ^{db} | MR | MRMS | S | MSS | MRMS | MSS | – | – |
| Chief CL Plus ^{db} | RMR | MSS | MR | MS | MRMS | SVS | MS | MS |
| Cutlass ^{db} | R | MS | R | MSS | MSS | MSS | MS | MR |
| Emu Rock ^{db} | MS | MRMS | SVS | SVS | MRMS | MSS | MS | S |
| Grenade CL Plus ^{db} | MR | MRMS | S | S | S | MS | MSS | MR |
| Kord CL Plus ^{db} | MR | MRMS | MS | MS | MSS | MS | MRMS | MR |
| LG Cobalt ^{db} | S | RMR | MSS | S | MSS | MSS | MRMS | MSS |
| LongReach Arrow ^{db} | S | S | SVS | S | MRMS | SVS | MRMS | MS |
| LongReach Cobra ^{db} | RMR | MSS | MR | S | MS | MSS | MSS | MS |
| LongReach Havoc ^{db} | S | MR | S | S | MRMS | S | MS | S |
| LongReach Impala ^{db} | MR | MR | SVS | VS | MSS | R | MS | MSS |
| LongReach Nighthawk ^{db} | RMR | RMR | MSS | MSS | MS | S | – | – |
| LongReach Orion ^{db} | MR | MSS | R | MRMS | MSS | SVS | S | MS |
| Mace ^{db} | MRMS | SVS | MSS | S | MRMS | MSS | MRMS | MRMS |
| Razor CL Plus ^{db} | MRMS | MS | S | SVS | MSS | MSS | MS | MR |
| RockStar ^{db} | MR | MRMS | S | MSS | MRMS | S | – | – |
| Scepter ^{db} | MRMS | MSS | MSS | S | MRMS | SVS | MS | MRMS |
| LongReach Scout ^{db} | MR | MS | MS | S | SVS | MS | S | R |
| Sheriff CL Plus ^{db} | MS | MSS | SVS | S | MRMS | SVS | MRMS | MS |
| Tenfour ^{db} | S | SVS | MS | SVS | MRMS | S | MRMS | MS |
| LongReach Trojan ^{db} | MRMS | MR | MRMS | MS | MSS | SVS | MS | MS |
| Vixen ^{db} | MRMS | MRMS | SVS | S | MRMS | SVS | MS | MSS |
| Wyalkatchem ^{db} | MSS | S | S | S | MR | SVS | MS | S |
| Yitpi ^{db} | S | MRMS | S | MSS | SVS | MS | MS | MR |

Disease rating codes: R = resistant; MR = moderately resistant; MS = moderately susceptible; S = susceptible; VS = very susceptible; – variety yet to be fully evaluated.

* Provisional rating based on limited NVT data. Ratings provided are primarily from 2018 and earlier with limited updates based on 2019 data.

Cereal cyst nematode (CCN) resistance refers to the ability of the variety to reduce CCN carryover. Black point is not a disease but is a physiological response to certain humid conditions.

Information on disease reaction was supplied by the Field Crop Pathology Unit (SARDI). Contact Dr Hugh Wallwork: hugh.wallwork@sa.gov.au or Dr Tara Garrard: tara.garrard@sa.gov.au

WHEAT VARIETY NOTES

Beckom[®]

Beckom[®] is a mid-season maturing AH wheat suited to the medium-high yield potential environments of SA. Beckom[®] is resistant to cereal cyst nematode (CCN) and shows moderate resistance (MRMS) to Stripe rust, but is susceptible to Leaf rust and Septoria tritici blotch. Beckom[®] has a tendency for small grain size especially in tight finishing seasons. Seed available from AGT affiliates and Seed Sharing™. (EPR \$3.25/tonne GST ex).

Catapult[®]

Catapult[®] was released in 2019 by AGT as a variety for late April/early May sowing. Catapult[®] offers wide adaptation and has a slightly slower development pattern suited for earlier planting opportunities in late April to early May. Yield evaluation of Catapult[®] from earlier sowing is limited in SA and more evaluation is required. Initial data suggests Catapult[®] produces grain with high test weights and low screenings and is suitable for wheat on wheat situations, having good Yellow leaf spot resistance. Seed available from AGT Affiliates, retailers or through Seed Sharing™. (EPR \$3.25/t GST ex).

Chief CL Plus[®]

Chief CL Plus[®] is a mid-season (maturing slightly later than Mace[®]), imidazolinone herbicide tolerant (Clearfield® Plus) APW wheat, derived from Wyalkatchem[®] and released in 2016 by InterGrain. Chief CL Plus[®] has good resistance to Leaf rust and Stem rust, useful resistance to Septoria (MS) and Yellow leaf spot (MRMS), but is susceptible to Powdery mildew (SVS) and Stripe rust (MSS). The long-term results show grain yields similar to Wyalkatchem[®] in many districts. Seed is available for 2020 planting from local resellers or InterGrain Seedclub members. (EPR \$4.25/t GST ex).

LG Cobalt[®]

LG Cobalt[®] is a mid-season developing cultivar with an APW grain quality classification in SA. Long-term yield performance of LG Cobalt[®] suggests it is similar to Mace[®] in most SA districts. LG Cobalt[®] is susceptible to most diseases although resistant to Stripe rust. LG Cobalt[®] is available through Elders and selected seed partners.

Cutlass[®]

Cutlass[®] has an APW classification in SA and was released by AGT in 2015. Cutlass[®] is a mid to late-maturing variety like Yitpi[®]. Cutlass[®] is rated as moderately resistant to CCN with good resistance to Stem and Leaf rust and relatively good (MS) for Septoria tritici blotch. Cutlass[®] is lower yielding than fast-mid developing cultivars from May sowing dates. Cutlass[®] has a unique flowering behaviour and commercial and agronomy data suggests it has an application for early sowing and frost risk management where Yitpi[®] has been successful. Seed available from AGT Affiliates, retailers or through Seed Sharing™. (EPR \$3.00/t GST ex).

Emu Rock[®]

Emu Rock[®] is a fast-developing AH quality variety for mid to late sowings in a broad range of environments across Southern Australia. Emu Rock[®] is susceptible to CCN, Septoria tritici blotch (S-VS), Leaf rust and Powdery mildew but has moderate resistance (MRMS) to stem and Stripe rust and Yellow leaf spot. Across NVT in SA, Emu Rock[®] has shown yields aligned with Wyalkatchem[®]. Seed is available from InterGrain and is approved for grower to grower trade. (EPR \$3.50/t GST ex).

Grenade CL Plus[®]

Grenade CL Plus[®] is an imidazolinone herbicide tolerant (Clearfield®) AH variety. It is early to mid-season flowering with moderate resistance to CCN, Stem rust (MR) and Stripe rust (MRMS). It is, however, susceptible to Leaf rust and Septoria tritici blotch. Seed available from AGT Affiliates. (EPR \$3.80/t GST ex).

Kord CL Plus[®]

Kord CL Plus[®] carries two genes for Clearfield® resistance and is derived from Gladius[®] with similar maturity and susceptibility to pre-harvest sprouting but is MR to CCN. Kord CL Plus[®] has an AH classification and has yielded similar to Gladius[®] in all districts. Seed is available from AGT affiliates. (EPR \$3.55/t GST ex).

LongReach Arrow[®]

LongReach Arrow[®] is an AH quality wheat from LongReach Plant Breeders, released in 2016. LongReach Arrow[®] is a mid-season wheat and develops at a similar speed to Scepter[®]. For SA NVT, LongReach Arrow[®] yields were similar to Mace[®] in the lower-medium yielding environments and had a small improvement over Mace[®] in the higher yielding environments. LongReach Arrow[®] is susceptible to Septoria tritici blotch, Powdery mildew stripe, stem and Leaf rust but is MRMS to Yellow leaf spot. LongReach Arrow[®] has good physical grain quality with good black point resistance (MRMS) and relatively short plant height suited to stubble retained systems. Seed is available from Pacific Seeds. (EPR \$3.00/t GST ex).

LongReach Cobra[®]

LongReach Cobra[®] was released as an early maturing Westonia derivative with AH quality and high yield potential, particularly in the medium to higher rainfall districts of SA. LongReach Cobra[®] has good resistance to Stem rust and Leaf rust but rated MSS to Stripe rust, and MS to Septoria tritici blotch, CCN and Yellow leaf spot. LongReach Cobra[®] has good grain size and moderate test weight and is moderately susceptible to pre-harvest sprouting. Seed is available from Pacific Seeds. (EPR \$3.50/t GST ex).

LongReach Havoc[®]

LongReach Havoc[®] is an early maturing Mace[®] derivative with AH quality. Havoc has a shorter canopy than Mace[®]. It is susceptible to leaf and Stem rust and Septoria tritici blotch but moderately resistant to Stripe rust. Long-term yield performance is similar or slightly below Mace[®] in most environments. Seed is available from Pacific Seeds. (EPR \$4.00/t GST ex).

LongReach Trojan[®]

LongReach Trojan[®] is a mid-maturing (slightly later than Mace[®]), APW quality variety with high yield potential, particularly in medium to high-rainfall districts. LongReach Trojan[®] is well suited to mid-season plantings in high production zones and slightly earlier planting in medium rainfall zones. It has good or useful resistance to Stem rust, Leaf rust, Stripe rust, Septoria tritici blotch and eyespot but is rated SVS for Powdery mildew. LongReach Trojan[®] has large grain size with low screenings, high test weight and good black point resistance. Seed is available from Pacific Seeds. (EPR \$4.00/t GST ex).

Mace[®]

Mace[®] has early to mid-season maturity, and an AH classification. It is SVS to Stripe rust and S to Septoria tritici blotch but is slightly better (MSS) to Powdery mildew than similar varieties. Mace[®] has been widely tested since 2009 in NVT in SA and shows wide adaptation coupled with high yield potential and wheat on wheat application. Seed is available from AGT affiliates and Seed Sharing™. (EPR \$3.00/t GST ex).

Razor CL Plus[®]

Razor CL Plus[®] is an imidazolinone herbicide tolerant (Clearfield® Plus) ASW wheat released by AGT. Razor CL Plus[®] is an early developing variety, slightly quicker than Mace[®]. The long-term performance of Razor CL Plus[®] suggests it is the highest yielding Clearfield® variety and on average is three per cent higher than Mace[®]. Razor CL Plus[®] is rated SVS for Septoria tritici blotch, S to Leaf rust, and MS to Stripe rust but MR to CCN. Seed is available from AGT affiliates. (EPR \$3.30/t GST ex).

RockStar[®]

RockStar[®] has been released in 2019 by InterGrain. RockStar[®] offers wide adaptation but has a slightly slower development pattern suited for earlier planting opportunities in late April to early May. Yield performance from May to June sowing dates in 2018 suggests that RockStar[®] yields similarly or slightly less than Scepter[®]. Yield evaluation of RockStar[®] from earlier sowing is limited in SA and more evaluation is required. RockStar[®] is rated MRMS to Stripe rust and Yellow leaf spot, S to Powdery mildew and Leaf rust, and MSS to Septoria. RockStar[®] is available for planting in 2020 from local resellers and Seedclub members. (EPR \$3.50/t GST ex).

Scepter[®]

Scepter[®] has an AH classification in SA, was released by AGT in 2015 and is now the most widely grown wheat variety in SA. Scepter[®] is largely derived from Mace[®] with many similar characteristics although it has improved grain yield and Stripe rust resistance and is more susceptible to Powdery mildew. Scepter[®] is rated MR to Stem rust, MSS to Leaf rust and is rated MRMS to CCN and Yellow leaf spot. Scepter[®] shows wide adaptation and is suitable for wheat on wheat application except where Septoria tritici blotch and Powdery mildew are likely to be a problem. Seed is available from AGT Affiliates, retailers or through Seed Sharing™. (EPR \$3.25/t GST ex).

Sheriff CL Plus[Ⓢ]

Sheriff CL Plus[Ⓢ] is an imidazolinone herbicide tolerant (Clearfield® Plus) APW wheat released by InterGrain in 2018. Sheriff CL Plus[Ⓢ] is a mid to late-flowering variety, is similar to LongReach Trojan[Ⓢ] in developmental speed and can be sown slightly earlier than the other Clearfield® Plus wheat varieties. The long-term NVT performance of Sheriff CL Plus[Ⓢ] suggests it yields similarly to Mace[Ⓢ] and has stable yields across most regions. Sheriff CL Plus[Ⓢ] is rated SVS to Leaf rust and Powdery mildew, MSS to stem and Stripe rust, S to Septoria tritici blotch, MRMS to Yellow leaf spot, and MS to CCN. Seed is available for planting in 2020 from local resellers or InterGrain Seedclub members. (EPR \$4.25/t GST ex).

Vixen[Ⓢ]

Vixen[Ⓢ] is an early flowering variety that develops slightly quicker than Scepter[Ⓢ]. Vixen[Ⓢ] was released by InterGrain in 2018 and has an AH Classification in SA. Long-term data suggests performance is similar to Scepter[Ⓢ], but it performed slightly above Scepter[Ⓢ] in 2016 evaluation. The variety's development speed is suited to mid-May to later sowings. Vixen[Ⓢ] is rated SVS to Leaf rust and Powdery mildew, MRMS to stem and Stripe rust, S to Septoria tritici blotch, MRMS to Yellow leaf spot, and S to CCN. Vixen[Ⓢ] seed is approved for grower to grower trading and seed is available through local resellers or InterGrain Seedclub members. (EPR \$3.50/t GST ex).

Soft wheats**LongReach Impala[Ⓢ]**

LongReach Impala[Ⓢ] is an early to mid-season soft biscuit (ASF1) wheat targeted to eastern Australia. Impala has mid-season maturity, is susceptible to CCN, has good stem and Stripe rust resistance, but is very susceptible to Septoria tritici blotch and Leaf rust. LongReach Impala[Ⓢ] produces large grain with low screening losses and is MRMS to black point. Seed is available from Pacific Seeds. (EPR \$3.50/t GST ex).

LongReach Orion[Ⓢ]

LongReach Orion[Ⓢ] is a mid to long-season maturing soft biscuit (ASF1) wheat targeted to eastern Australia. LongReach Orion[Ⓢ] has good resistance to Septoria tritici blotch (MRMS) as well as stem and Leaf rust but is susceptible to Stripe rust, Powdery mildew, black point and to sprouting. Seed is available from Pacific Seeds. (EPR \$3.00/t GST ex).

Feed and unclassified wheats**LongReach Nighthawk[Ⓢ]**

LongReach Nighthawk[Ⓢ] has a feed classification in SA, and is a slow-developing spring wheat bred for early germination opportunities prior to 25 April. It is suited to early planting or grazing opportunities similar to winter wheat in the higher rainfall zones. Early sowing agronomy data suggests LongReach Nighthawk[Ⓢ] has similar or higher yields than winter wheats when established in mid-April. LongReach Nighthawk[Ⓢ] has good resistance to stem and Stripe rust but is MSS to Leaf rust and Septoria tritici blotch and S to Powdery mildew. More evaluation is needed. Seed is available from Pacific Seeds. (EPR \$4.25/t GST ex).

Tenfour[Ⓢ]

Tenfour[Ⓢ] is a white-grained feed wheat released in 2015 that has shown high yield potential in SA NVT across a wide range of environments. Tenfour[Ⓢ] is available through Elders and selected seed partners. (EPR \$3.00/t GST ex).

Zanzibar[Ⓢ]

Zanzibar[Ⓢ] is a red spring wheat with feed grain quality, suited to the medium high rainfall zone. Zanzibar[Ⓢ] has good standability and is slow to develop, developing later than Cutlass[Ⓢ]. It is, however, very susceptible to Stem rust, making this variety a high risk should Stem rust occur, and so should be grown with caution. Seed is available from Seed Force Broadacre Commercial Partners. (EPR \$4.00/t GST ex).

YIELD PERFORMANCE EXPERIMENTS 2014–18

The yield results presented (Tables 3 to 8) are multi-environment trial (MET) data shown on a yearly regional group mean and an overall performance mean for the region. All yields are expressed as a percentage of mean yield from NVT data 2014 to 2018 inclusive, along with number of observations in adjacent columns. Further results can be found on the NVT website: www.nvtonline.com.au.

TABLE 3 South East wheat yield performance. NVT data 2014–18.

Long-term yield expressed as a percentage of mean yield.

| | | Year | 2014 | 2015 | 2016 | 2017 | 2018 |
|----------------------------------|----------------|-----------------|------|------|------|------|------|
| | | Mean yield t/ha | 2.63 | 3.96 | 5.62 | 4.17 | 4.00 |
| Variety | Classification | No. trials | 3 | 2 | 3 | 1 | 2 |
| MILLING WHEATS | | | | | | | |
| Beckom ^{db} | AH | 11 | 110 | 109 | 107 | 105 | 109 |
| Catapult ^{db} | AH | 2 | – | – | – | – | 110 |
| Cutlass ^{db} | APW | 8 | – | 100 | 103 | 95 | 103 |
| Emu Rock ^{db} | AH | 11 | 96 | 100 | 98 | 105 | 101 |
| LG Cobalt ^{db} | APW | 2 | – | – | – | – | 106 |
| LongReach Arrow ^{db} | AH | 8 | – | 108 | 105 | 107 | 106 |
| LongReach Cobra ^{db} | AH | 11 | 98 | 107 | 110 | 107 | 103 |
| LongReach Havoc ^{db} | AH | 6 | – | – | 100 | 113 | 102 |
| LongReach Scout ^{db} | AH | 11 | 97 | 101 | 105 | 99 | 103 |
| LongReach Trojan ^{db} | APW | 11 | 110 | 110 | 111 | 102 | 109 |
| Mace ^{db} | AH | 11 | 107 | 106 | 99 | 108 | 104 |
| RockStar ^{db} | AH | 2 | – | – | – | – | 113 |
| Scepter ^{db} | AH | 8 | – | 114 | 105 | 110 | 113 |
| Vixen ^{db} | AH | 5 | – | – | 109 | – | 116 |
| Wyalkatchem ^{db} | APW | 11 | 102 | 102 | 99 | 104 | 100 |
| Yitpi ^{db} | AH | 11 | 97 | 91 | 95 | 89 | 94 |
| CLEARFIELD® PLUS | | | | | | | |
| Chief CL Plus ^{db} | APW | 9 | 107 | – | 97 | 103 | 99 |
| Grenade CL Plus ^{db} | AH | 11 | 93 | 92 | 92 | 96 | 95 |
| Kord CL Plus ^{db} | AH | 11 | 95 | 90 | 89 | 93 | 94 |
| Razor CL Plus ^{db} | ASW | 3 | – | – | – | 111 | 108 |
| Sheriff CL Plus ^{db} | APW | 5 | – | – | 105 | – | 106 |
| FEED WHEATS | | | | | | | |
| LongReach Beaufort ^{db} | FEED | 2 | – | – | – | – | 101 |
| Zanzibar ^{db} | FEED | 6 | – | – | 109 | 94 | 99 |

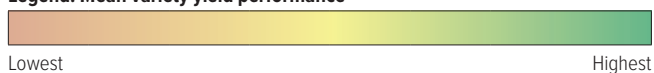
Legend: Mean variety yield performance

TABLE 4 Yorke Peninsula wheat yield performance. NVT data 2014–18.

Long-term yield expressed as a percentage of mean yield.

| | | Year | 2014 | 2015 | 2016 | 2017 | 2018 |
|--------------------------------|----------------|-----------------|------|------|------|------|------|
| | | Mean yield t/ha | 4.36 | 3.08 | 6.03 | 4.49 | 3.97 |
| Variety | Classification | No. trials | 3 | 3 | 3 | 3 | 3 |
| MILLING WHEATS | | | | | | | |
| Beckom ^{db} | AH | 15 | 110 | 105 | 107 | 106 | 107 |
| Catapult ^{db} | AH | 3 | – | – | – | – | 110 |
| Cutlass ^{db} | APW | 12 | – | 96 | 103 | 102 | 105 |
| Emu Rock ^{db} | AH | 15 | 102 | 105 | 99 | 99 | 99 |
| LG Cobalt ^{db} | APW | 3 | – | – | – | – | 105 |
| LongReach Arrow ^{db} | AH | 12 | – | 108 | 103 | 105 | 103 |
| LongReach Cobra ^{db} | AH | 15 | 97 | 105 | 111 | 102 | 99 |
| LongReach Havoc ^{db} | AH | 9 | – | – | 95 | 104 | 97 |
| LongReach Scout ^{db} | AH | 15 | 98 | 98 | 108 | 99 | 103 |
| LongReach Trojan ^{db} | APW | 15 | 107 | 103 | 111 | 106 | 107 |
| Mace ^{db} | AH | 15 | 110 | 110 | 96 | 104 | 101 |
| RockStar ^{db} | AH | 2 | – | – | – | – | 111 |
| Scepter ^{db} | AH | 12 | – | 113 | 102 | 110 | 110 |
| Vixen ^{db} | AH | 9 | – | – | 110 | 110 | 111 |
| Wyalkatchem ^{db} | APW | 15 | 103 | 104 | 97 | 101 | 98 |
| Yitpi ^{db} | AH | 15 | 94 | 89 | 95 | 96 | 99 |
| CLEARFIELD® PLUS | | | | | | | |
| Chief CL Plus ^{db} | APW | 12 | 106 | – | 91 | 103 | 97 |
| Grenade CL Plus ^{db} | AH | 15 | 95 | 96 | 93 | 95 | 97 |
| Kord CL Plus ^{db} | AH | 15 | 97 | 94 | 89 | 95 | 97 |
| Razor CL Plus ^{db} | ASW | 6 | – | – | – | 104 | 104 |
| Sheriff CL Plus ^{db} | APW | 6 | – | – | 103 | – | 104 |
| FEED WHEATS | | | | | | | |
| Zanzibar ^{db} | FEED | 3 | – | – | 111 | – | – |

TABLE 5 Murray Mallee wheat yield performance. NVT data 2014–18.

Long-term yield expressed as a percentage of mean yield.

| | | Year | 2014 | 2015 | 2016 | 2017 | 2018 |
|--------------------------------|----------------|-----------------|------|------|------|------|------|
| | | Mean yield t/ha | 2.69 | 1.60 | 4.12 | 3.43 | 1.73 |
| Variety | Classification | No. trials | 4 | 3 | 6 | 1 | 4 |
| MILLING WHEATS | | | | | | | |
| Beckom ^{db} | AH | 18 | 112 | 110 | 108 | 108 | 107 |
| Catapult ^{db} | AH | 4 | – | – | – | – | 110 |
| Cutlass ^{db} | APW | 14 | – | 107 | 104 | 105 | 102 |
| Emu Rock ^{db} | AH | 18 | 103 | 97 | 98 | 95 | 103 |
| LG Cobalt ^{db} | APW | 4 | – | – | – | – | 105 |
| LongReach Arrow ^{db} | AH | 14 | – | 105 | 104 | 107 | 104 |
| LongReach Cobra ^{db} | AH | 18 | 94 | 95 | 103 | 98 | 98 |
| LongReach Havoc ^{db} | AH | 11 | – | – | 98 | 105 | 101 |
| LongReach Scout ^{db} | AH | 18 | 101 | 100 | 104 | 95 | 102 |
| LongReach Trojan ^{db} | APW | 18 | 108 | 110 | 110 | 109 | 105 |
| Mace ^{db} | AH | 18 | 109 | 105 | 101 | 107 | 104 |
| RockStar ^{db} | AH | 4 | – | – | – | – | 111 |
| Scepter ^{db} | AH | 14 | – | 116 | 110 | 115 | 113 |
| Vixen ^{db} | AH | 11 | – | – | 112 | 110 | 114 |
| Wyalkatchem ^{db} | APW | 18 | 100 | 100 | 99 | 103 | 100 |
| Yitpi ^{db} | AH | 18 | 96 | 100 | 97 | 98 | 97 |
| CLEARFIELD® PLUS | | | | | | | |
| Chief CL Plus ^{db} | APW | 15 | 100 | – | 98 | 109 | 99 |
| Grenade CL Plus ^{db} | AH | 18 | 97 | 95 | 94 | 93 | 98 |
| Kord CL Plus ^{db} | AH | 18 | 99 | 98 | 93 | 95 | 99 |
| Razor CL Plus ^{db} | ASW | 5 | – | – | – | 102 | 107 |
| Sheriff CL Plus ^{db} | APW | 10 | – | – | 105 | – | 104 |
| FEED WHEATS | | | | | | | |
| Tenfour ^{db} | FEED | 14 | 105 | 100 | 106 | 103 | – |
| Zanzibar ^{db} | FEED | 6 | – | – | 103 | – | – |

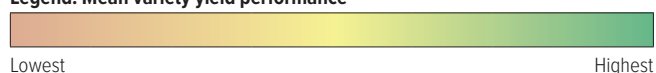
Legend: Mean variety yield performance

TABLE 6 Mid North wheat yield performance. NVT data 2014–18.

Long-term yield expressed as a percentage of mean yield.

| | | Year | 2014 | 2015 | 2016 | 2017 | 2018 |
|--------------------------------|----------------|-----------------|------|------|------|------|------|
| | | Mean yield t/ha | 3.97 | 2.88 | 5.65 | 3.32 | 2.67 |
| Variety | Classification | No. trials | 4 | 4 | 3 | 3 | 2 |
| MILLING WHEATS | | | | | | | |
| Beckom ^{db} | AH | 16 | 106 | 104 | 108 | 105 | 106 |
| Catapult ^{db} | AH | 2 | – | – | – | – | 108 |
| Corack ^{db} | APW | 16 | 107 | 115 | 98 | 110 | 110 |
| Cutlass ^{db} | APW | 12 | – | 93 | 104 | 98 | 99 |
| Emu Rock ^{db} | AH | 16 | 100 | 108 | 98 | 104 | 105 |
| LG Cobalt ^{db} | APW | 16 | 106 | 104 | 103 | 105 | 106 |
| LongReach Arrow ^{db} | AH | 12 | – | 107 | 104 | 106 | 105 |
| LongReach Cobra ^{db} | AH | 16 | 103 | 104 | 106 | 102 | 97 |
| LongReach Havoc ^{db} | AH | 8 | – | – | 97 | 109 | 107 |
| LongReach Impala ^{db} | ASFT | 15 | 93 | 92 | 97 | 94 | 97 |
| LongReach Orion ^{db} | ASFT | 6 | 90 | – | – | 88 | 89 |
| LongReach Scout ^{db} | AH | 16 | 99 | 99 | 105 | 99 | 99 |
| LongReach Trojan ^{db} | APW | 16 | 106 | 100 | 110 | 103 | 102 |
| Mace ^{db} | AH | 16 | 105 | 110 | 99 | 107 | 109 |
| RockStar ^{db} | AH | 2 | – | – | – | – | 110 |
| Scepter ^{db} | AH | 12 | – | 113 | 107 | 112 | 116 |
| Vixen ^{db} | AH | 5 | – | – | – | 114 | 117 |
| Wyalkatchem ^{db} | APW | 16 | 102 | 104 | 98 | 103 | 102 |
| Yitpi ^{db} | AH | 16 | 94 | 88 | 97 | 92 | 94 |
| CLEARFIELD® PLUS | | | | | | | |
| Chief CL Plus ^{db} | APW | 12 | 104 | – | 95 | 103 | 102 |
| Grenade CL Plus ^{db} | AH | 16 | 94 | 98 | 94 | 97 | 99 |
| Kord CL Plus ^{db} | AH | 16 | 94 | 96 | 92 | 96 | 100 |
| Razor CL Plus ^{db} | ASW | 5 | – | – | – | 109 | 109 |
| Sheriff CL Plus ^{db} | APW | 5 | – | – | 104 | – | 104 |
| FEED WHEATS | | | | | | | |
| Tenfour ^{db} | FEED | 14 | 109 | 116 | 107 | 111 | – |
| Zanzibar ^{db} | FEED | 8 | – | – | 107 | 93 | 89 |

TABLE 7 Lower Eyre Peninsula wheat yield performance. NVT data 2014–18.

Long-term yield expressed as a percentage of mean yield.

| | | Year | 2014 | 2015 | 2016 | 2017 | 2018 |
|--------------------------------|----------------|-----------------|------|------|------|------|------|
| | | Mean yield t/ha | 3.45 | 3.65 | 4.89 | 2.94 | 3.65 |
| Variety | Classification | No. trials | 3 | 4 | 2 | 3 | 3 |
| MILLING WHEATS | | | | | | | |
| Beckom ^{db} | AH | 15 | 107 | 107 | 109 | 108 | 108 |
| Catapult ^{db} | AH | 3 | – | – | – | – | 108 |
| Cutlass ^{db} | APW | 12 | – | 96 | 101 | 102 | 103 |
| Emu Rock ^{db} | AH | 15 | 100 | 105 | 102 | 101 | 99 |
| LG Cobalt ^{db} | APW | 3 | – | – | – | – | 108 |
| LongReach Arrow ^{db} | AH | 12 | – | 109 | 106 | 107 | 106 |
| LongReach Cobra ^{db} | AH | 15 | 103 | 107 | 107 | 98 | 99 |
| LongReach Havoc ^{db} | AH | 8 | – | – | 102 | 106 | 103 |
| LongReach Scout ^{db} | AH | 15 | 100 | 99 | 105 | 98 | 99 |
| LongReach Trojan ^{db} | APW | 15 | 107 | 105 | 109 | 107 | 107 |
| Mace ^{db} | AH | 15 | 105 | 109 | 103 | 108 | 106 |
| RockStar ^{db} | AH | 3 | – | – | – | – | 112 |
| Scepter ^{db} | AH | 12 | – | 114 | 112 | 117 | 114 |
| Vixen ^{db} | AH | 6 | – | – | – | 116 | 113 |
| Wyalkatchem ^{db} | APW | 15 | 101 | 104 | 99 | 102 | 101 |
| Yitpi ^{db} | AH | 15 | 95 | 88 | 92 | 95 | 97 |
| CLEARFIELD® PLUS | | | | | | | |
| Chief CL Plus ^{db} | APW | 11 | 102 | – | 95 | 105 | 104 |
| Grenade CL Plus ^{db} | AH | 15 | 94 | 94 | 94 | 95 | 95 |
| Kord CL Plus ^{db} | AH | 15 | 94 | 92 | 91 | 97 | 96 |
| Razor CL Plus ^{db} | ASW | 6 | – | – | – | 107 | 105 |
| Sheriff CL Plus ^{db} | APW | 5 | – | – | 105 | – | 106 |

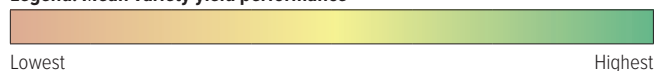
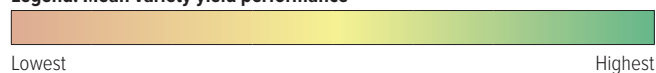
Legend: Mean variety yield performance

TABLE 8 Upper Eyre Peninsula wheat yield performance. NVT data 2014–18.

Long-term yield expressed as a percentage of mean yield.

| | | Year | 2014 | 2015 | 2016 | 2017 | 2018 |
|--------------------------------|----------------|-----------------|------|------|------|------|------|
| | | Mean yield t/ha | 2.33 | 1.79 | 2.43 | 1.21 | 1.52 |
| Variety | Classification | No. trials | 3 | 7 | 6 | 5 | 5 |
| MILLING WHEATS | | | | | | | |
| Beckom ^{db} | AH | 26 | 105 | 105 | 107 | 106 | 106 |
| Catapult ^{db} | AH | 5 | – | – | – | – | 104 |
| Corack ^{db} | APW | 26 | 106 | 112 | 99 | 104 | 106 |
| Cutlass ^{db} | APW | 23 | – | 98 | 103 | 103 | 104 |
| Emu Rock ^{db} | AH | 26 | 102 | 102 | 102 | 99 | 97 |
| LG Cobalt ^{db} | APW | 26 | 104 | 107 | 103 | 106 | 108 |
| LongReach Arrow ^{db} | AH | 23 | – | 107 | 103 | 104 | 105 |
| LongReach Cobra ^{db} | AH | 26 | 102 | 102 | 101 | 98 | 96 |
| LongReach Havoc ^{db} | AH | 16 | – | – | 97 | 102 | 104 |
| LongReach Scout ^{db} | AH | 26 | 100 | 96 | 105 | 99 | 95 |
| LongReach Trojan ^{db} | APW | 26 | 104 | 104 | 106 | 105 | 106 |
| Mace ^{db} | AH | 26 | 104 | 109 | 101 | 104 | 106 |
| RockStar ^{db} | AH | 5 | – | – | – | – | 108 |
| Scepter ^{db} | AH | 23 | – | 113 | 109 | 111 | 112 |
| Vixen ^{db} | AH | 10 | – | – | – | 110 | 107 |
| Wyalkatchem ^{db} | APW | 26 | 101 | 104 | 98 | 101 | 103 |
| Yitpi ^{db} | AH | 26 | 95 | 93 | 98 | 98 | 99 |
| CLEARFIELD® PLUS | | | | | | | |
| Chief CL Plus ^{db} | APW | 19 | 101 | – | 95 | 103 | 108 |
| Grenade CL Plus ^{db} | AH | 26 | 97 | 95 | 98 | 97 | 96 |
| Kord CL Plus ^{db} | AH | 26 | 96 | 95 | 97 | 98 | 98 |
| Razor CL Plus ^{db} | ASW | 16 | – | – | 106 | 104 | 101 |
| Sheriff CL Plus ^{db} | APW | 16 | – | – | 103 | 105 | 106 |

Legend: Mean variety yield performance

GRAIN QUALITY

Grain quality for individual varieties varies from site to site and from year to year; however, long-term trends highlight varieties that can consistently achieve either higher test weights or low grain screenings under a wider range of environments. The graphs shown in Figures 2 to 5 aim to demonstrate variety trends in key grain quality traits from 2017 and 2018 trials. Sheriff CL Plus[®], Catapult[®] and RockStar[®] were unable to be included in 2017 data due to limited data points but were included in 2018.

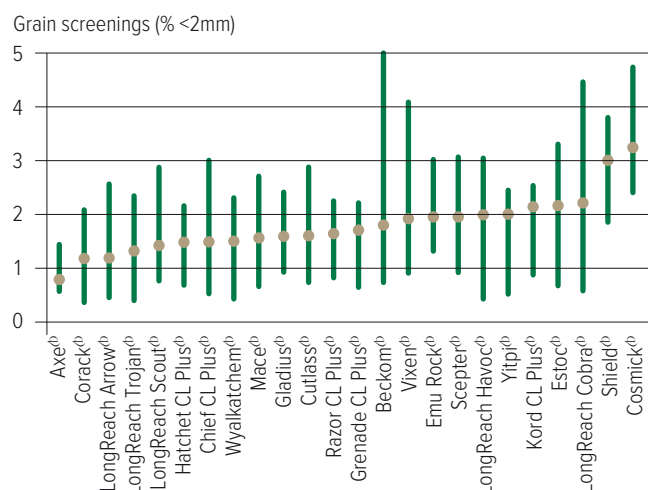


FIGURE 2 The median grain screenings of wheat varieties in 2017 NVT (see circle on each bar). Varieties are ranked in increasing order of grain screenings for the 2017 season. The bars represent the range in which grain screenings have occurred in 50 per cent of trials. The shorter the bar the more consistent the variety.

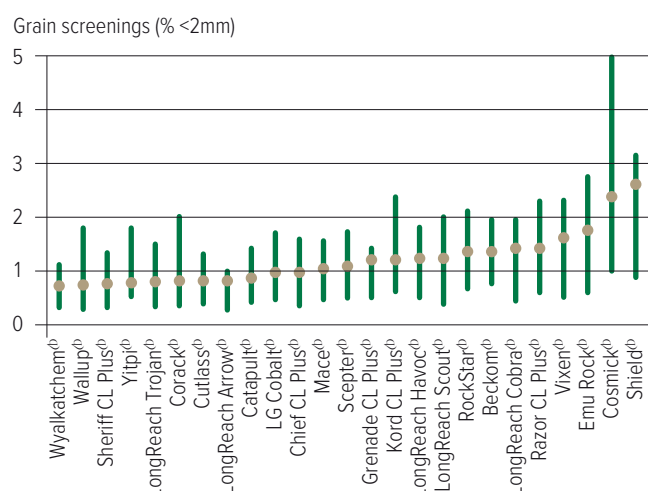


FIGURE 3 The median grain screenings of wheat varieties in 2018 NVT (see circle on each bar). Varieties are ranked in increasing order of grain screenings for the 2018 season. The bars represent the range in which grain screenings have occurred in 50 per cent of trials. The shorter the bar the more consistent the variety.

While screenings were low in 2017 and 2018, the general trends demonstrated Shield[®] and Cosmick[®] had higher screening levels and were generally more variable, these cultivars have now been outclassed. The new releases Catapult[®] and Sheriff CL Plus[®] had less screenings in 2018 than another recent release, Vixen[®].



FIGURE 4 The median test weight (kg/hL) of wheat varieties in 2017 NVT (see circle on each bar). Varieties are ranked in descending order of test weight for the 2017 season. The bars represent the range in which grain test weights have occurred in 50 per cent of trials. The shorter the bar the more consistent the variety.

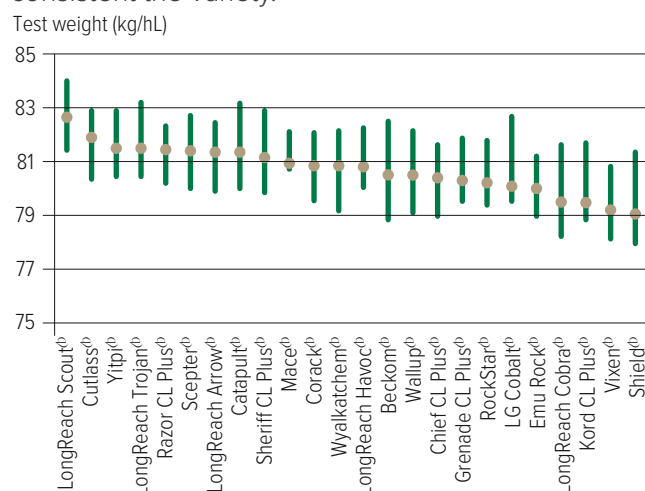


FIGURE 5 The median test weight (kilogram/hectolitre) of wheat varieties in 2018 NVT (see circle on each bar). Varieties are ranked in descending order of test weight for the 2018 season. The bars represent the range in which grain test weights have occurred in 50 per cent of trials. The shorter the bar the more consistent the variety.

Test weights were less variable in 2017 compared to 2018. Variety trends between seasons were similar. LongReach Scout[®] expressed consistently high test weights, while Shield[®] and LongReach Cobra[®] were consistently at the lower end. Among the new releases, Vixen[®] and RockStar[®] trended lower and Catapult[®] trended higher.

WINTER WHEAT VARIETY NOTES

Winter wheats may facilitate early germination opportunities prior to 20 April in frost-prone environments. Winter wheats have an obligate requirement for cold (vernalisation) in order to flower. While limited yield data is provided in this guide, the winter cultivars Longsword[®], Illabo[®], LongReach Kittyhawk[®], RGT Accroc and DS Bennett[®] are all commercially available in 2020 and are being trialled in early-sown NVT and a series of agronomy trials across SA as part of GRDC management of early-sown wheat project.

DS Bennett[®]

DS Bennett[®] was released in 2018 and has an ASW classification in SA. DS Bennett[®] is a slow-developing winter wheat that has been developed for longer season and higher rainfall growing areas. It is suited to early planting or grazing opportunities and will be later to flower than EGA Wedgetail[®]. DS Bennett[®] is rated S to Leaf rust, MRMS to stem and R to Stripe rust, MSS to Septoria and CCN. DS Bennett[®] may also be a higher risk for black point. Seed is available from Seednet partners. (EPR \$4.25/t GST ex).

Illabo[®]

Illabo[®] was released in 2018 by AGT and has an AH classification in SA. Illabo[®] is a mid to fast-developing winter wheat that has been developed for mid to long-season growing areas. It is suited to early planting or grazing opportunities similar to EGA Wedgetail[®] in the medium-high rainfall zones. Illabo[®] has shown a yield improvement compared to EGA Wedgetail[®] and LongReach Kittyhawk[®]. Illabo[®] is rated S to Leaf rust, MS to stem and RMR to Stripe rust, MSS to Septoria, and MS to CCN. Seed is available from AGT Affiliates, retailers or through Seed Sharing™. (EPR \$3.50/t GST ex).

LongReach Kittyhawk[®]

LongReach Kittyhawk[®] is an AH mid-winter wheat and has been developed for long-season growing areas. It is suited to early planting or grazing opportunities similar to EGA Wedgetail[®] in the higher rainfall zones. LongReach Kittyhawk has an improved disease and grain quality package compared to EGA Wedgetail[®], particularly for Septoria tritici blotch (MRMS) and Leaf rust (MS). More evaluation is needed. Seed is available from Pacific Seeds. (EPR \$4.25/t GST ex).

FEED WINTER WHEATS

Longsword[®]

Longsword[®] is classified as a feed wheat in SA. Longsword[®] is a fast-developing winter wheat which means that once its vernalisation requirement is met it is relatively fast to flower and is quicker to flower than EGA Wedgetail[®]. Longsword[®] has a broad sowing window but will be most suited to April plantings. Longsword[®] has not been widely tested in early-sowing NVT, but data from agronomic trials have shown it is the highest yielding winter wheat in the low rainfall zones. Longsword[®] has a good disease package and is rated MSS to Leaf rust, MR to stem and MR to Stripe rust, MSS to Septoria, and MRMS to CCN. Seed is available from AGT Affiliates, retailers or through Seed Sharing™. (EPR \$2.75/t GST ex).

Manning[®]

Manning[®] was released in 2013 as a very late flowering white-grained feed wheat for high rainfall zones in SE Australia. It is a dual purpose, grazing/grain winter wheat with high yield potential and Barley yellow dwarf virus (BYDV) resistance, coupled with good resistance to stem and Stripe rust and other foliar diseases. Seed is available from GrainSearch affiliates or contact GrainSearch for more details. (EPR \$3.50/t GST ex).

RGT Accroc

RGT Accroc is a red winter wheat, feed grain quality, suited to the high-rainfall zone and is suitable for sowing late February to early April for early grazing. Maturity is three to five days earlier than SF Adagio. RGT Accroc is rated S to Leaf rust, MS to stem and R to Stripe rust, MRMS to Yellow leaf spot, and S to CCN. Seed is available via Seed Force Broadacre Commercial Partners. (EPR \$4.00/t GST ex).

RGT Calabro

RGT Calabro is a red feed grain quality awned winter wheat with potential for high yields. It has medium to long-season maturity suited high rainfall zones. It is suitable for sowing late February to early March for early grazing. Contact Seed Force for Agent. (EPR \$4.00/t exc GST).

TABLE 9 Responses of slower developing wheats to disease and black point.

| Variety | Rust | | | Septoria tritici blotch | Yellow leaf spot | Powdery mildew | Black point | CCN |
|-----------------------------------|--------|--------|------|-------------------------|------------------|----------------|-------------|------|
| | Stem | Stripe | Leaf | | | | | |
| Bolac ^{db} | MRMS | RMR | MRMS | MSS | MSS | MRMS | MS | S |
| DS Bennett ^{db} | MRMS | RMR | S | MSS | MRMS | R | S | MSS |
| EGA Wedgetail ^{db} | RMR | R | SVS | MS | MS | MR | MS | MSS |
| Illabo ^{db} | MS | RMR | S | MSS | MS | MRMS | MS | MS |
| Kiora ^{db} | MR | RMR | MRMS | MS | MSS | MS | MS | MSS |
| LongReach Nighthawk ^{db} | RMR | RMR | MSS | MSS | MS | S | – | – |
| LongReach Kittyhawk ^{db} | MRMS-S | RMR | MS | MRMS | MRMS | MS | MS | S |
| Longsword ^{db} | MR | RMR | MSS | MSS | MRMS | MS | MRMS | MRMS |
| Manning ^{db} | MR | RMR | MS | MR | MRMS | MS | SVS | S |
| RGT Accroc | MS | R | S | MS | MRMS | MRMS | MRMS | S |
| RGT Calabro | MS | RMR | MSS | MRMS | MRMS | MR | MS | S |
| SQP Revenue ^{db} | RMR | R | VS | S | MS | R | MS | S |
| Zanzibar ^{db} | VS | R | SVS | S | MS | MRMS | MRMS | MSS |

Disease rating codes: R = resistant; MR = moderately resistant; MS = moderately susceptible; S = susceptible; VS = very susceptible; – variety yet to be fully evaluated.

* Provisional rating based on limited NVT data. Ratings provided are primarily from 2018 and earlier with limited updates based on 2019 data.

Cereal cyst nematode (CCN) resistance refers to the ability of the variety to reduce CCN carryover. Black point is not a disease but is a physiological response to certain humid conditions.

Information on disease reaction was supplied by the Field Crop Pathology Unit (SARDI). Contact Dr Hugh Wallwork: hugh.wallwork@sa.gov.au or Dr Tara Garrard: tara.garrard@sa.gov.au

TABLE 10 South East early season wheat yield performance. NVT data 2014–18.

Long-term yield expressed as a percentage of mean yield.

| | | Year | 2014 | 2015 | 2016 | 2017 | 2018 |
|-----------------------------------|----------------|-----------------|------|------|------|------|------|
| | | Mean yield t/ha | 4.65 | 5.90 | 5.60 | 5.85 | 7.58 |
| Variety | Classification | No. trials | 1 | 1 | 1 | 1 | 1 |
| MILLING WHEATS | | | | | | | |
| Beckom ^{db} | AH | 4 | – | 111 | 97 | 107 | 96 |
| Catapult ^{db} | AH | 1 | – | – | – | – | 103 |
| Coolah ^{db} | AH | 5 | 97 | 99 | 102 | 100 | 104 |
| Cutlass ^{db} | APW | 4 | – | 107 | 102 | 104 | 103 |
| DS Bennett ^{db} | ASW | 3 | – | – | 117 | 110 | 117 |
| DS Pascal ^{db} | APW | 5 | 114 | 108 | 99 | 100 | 98 |
| EGA Wedgetail ^{db} | APW | 5 | 97 | 98 | 103 | 99 | 102 |
| Forrest ^{db} | APW | 5 | 99 | 96 | 100 | 92 | 100 |
| Illabo ^{db} | AH | 3 | – | – | 104 | 111 | 101 |
| LongReach Kittyhawk ^{db} | AH | 4 | – | 100 | 101 | 99 | 99 |
| LongReach Scout ^{db} | AH | 2 | 105 | – | 97 | – | – |
| LongReach Trojan ^{db} | APW | 5 | 107 | 107 | 101 | 106 | 101 |
| Scepter ^{db} | AH | 1 | – | – | – | – | 102 |
| Yitpi ^{db} | AH | 1 | – | – | – | – | 96 |
| FEED WHEATS | | | | | | | |
| LongReach Beaufort ^{db} | FEED | 5 | 97 | 105 | 116 | 109 | 118 |
| LongReach Nighthawk ^{db} | FEED | 1 | – | – | – | – | 106 |
| Longsword ^{db} | FEED | 3 | – | – | 103 | 111 | 100 |
| Manning ^{db} | FEED | 5 | 95 | 103 | 117 | 109 | 116 |
| RGT Accroc | FEED | 5 | 101 | 111 | 125 | 116 | 125 |
| RGT Calabro | FEED | 4 | – | 111 | 128 | 121 | 126 |
| SF Adagio | FEED | 5 | 102 | 110 | 118 | 113 | 116 |
| SQP Revenue ^{db} | FEED | 4 | 92 | 101 | 119 | 107 | – |
| Zanzibar ^{db} | FEED | 3 | – | – | 116 | 116 | 116 |

Please note these data are generated only from the Conmurra site in the South East.

Sowing dates from these trials ranged from 28 April to 28 May during this period.

Early break trials were initiated by the GRDC NVT program for the first time in 2017. Due to frost and the lack of early break opportunity in 2018 the dataset in Table 11 is limited to one site on the Eyre Peninsula in 2017.

TABLE 11 Lower Eyre Peninsula early break wheat yield performance. NVT data 2014–18.

Long-term yield expressed as a percentage of mean yield.

| Early season | | Year | 2017 |
|----------------------------------|----------------|-----------------|------|
| | | Mean yield t/ha | 1.40 |
| Variety | Classification | No. trials | 1 |
| MILLING WHEATS | | | |
| Bolac [Ⓛ] | AH | 1 | 101 |
| Coolah [Ⓛ] | AH | 1 | 94 |
| Cutlass [Ⓛ] | APW | 1 | 106 |
| DS Bennett [Ⓛ] | ASW | 1 | 120 |
| DS Darwin [Ⓛ] | AH | 1 | 91 |
| DS Pascal [Ⓛ] | APW | 1 | 113 |
| EGA Wedgetail [Ⓛ] | AH | 1 | 106 |
| Estoc [Ⓛ] | APW | 1 | 96 |
| Illabo [Ⓛ] | AH | 1 | 125 |
| Kiora [Ⓛ] | AH | 1 | 105 |
| LongReach Kittyhawk [Ⓛ] | APW | 1 | 107 |
| LongReach Trojan [Ⓛ] | APW | 1 | 104 |
| Magenta [Ⓛ] | APW | 1 | 100 |
| Sunlamb [Ⓛ] | ASW | 1 | 96 |
| Yitpi [Ⓛ] | AH | 1 | 96 |
| FEED WHEATS | | | |
| Longsword [Ⓛ] | FEED | 1 | 117 |

Note: Murray Mallee 2017 trial not released.

In 2018 both Upper EP and Mallee trials not sown due to lack of early break opportunity.

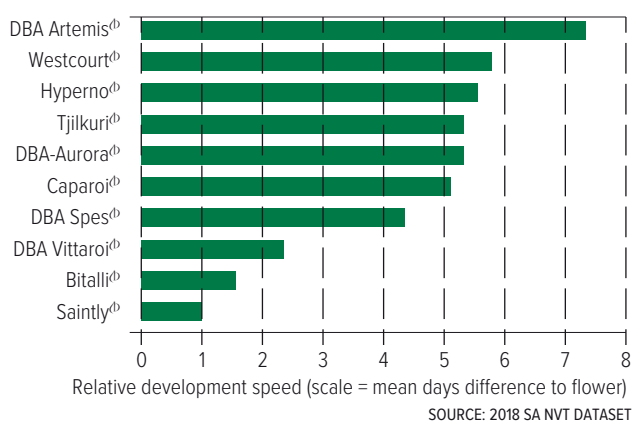


FIGURE 6 Relative speed of development of selected durum varieties sown during May and June across SA. Varieties are ranked according to time to flower.

DURUM WHEAT VARIETY NOTES

The development speed of different durum varieties were compared to Scepter[Ⓛ] and LongReach Trojan[Ⓛ] in sowing trials across a range of dates in May and two locations, Loxton and Tarlee in South Australia, in the 2018 season (SAGIT-funded project S518). From these trials, most of the durum varieties were characterised as fast-medium or medium-developing speed within the range of Scepter[Ⓛ] and Trojan[Ⓛ], and therefore suited to early-mid May sowing in SA. Currently, there are no released durum varieties suited for earlier planting.

Figure 6 illustrates the range of development speeds of durum varieties sown during the period from May to June across SA NVT in 2018.

Bitalli[Ⓛ]

Bitalli[Ⓛ] is a fast-developing durum variety, slightly slower than Saintly[Ⓛ]. Bitalli[Ⓛ] is widely adapted and yielded 3 per cent higher than DBA-Aurora[Ⓛ] in the Mid North and Yorke Peninsula in 2018. Bitalli[Ⓛ] offers good physical grain characteristics including low screenings and high test weight. It is MR to stem and Leaf rust and RMR to Stripe rust, while also being MRMS to both Yellow leaf spot and Septoria tritici blotch. Bitalli[Ⓛ] is eligible for Australian Premium Durum (ADR) in SA and was released by AGT in 2019 with seed available through AGT Affiliates, retailers or through Seed Sharing™. (EPR \$3.50/t GST ex).

DBA Artemis[Ⓛ]

DBA Artemis[Ⓛ] is a slightly slower developing variety than DBA-Aurora[Ⓛ] with a similar disease profile. It is RMR to both leaf and Stripe rust and MR to Stem rust. It is also MRMS to both Yellow leaf spot and Septoria tritici blotch. Grain size and screenings are comparable to DBA-Aurora[Ⓛ] and DBA Spes[Ⓛ]. DBA Artemis[Ⓛ] is eligible for ADR grade in SA and was released by Durum Breeding Australia's Southern Node (University of Adelaide) in 2019 with seed available from Southern Australia Durum Growers Association. (EPR \$3.00/T GST ex).

DBA Spes[Ⓛ]

DBA Spes[Ⓛ] has a similar development speed to DBA-Aurora[Ⓛ]. It has a good disease package being RMR to stem and Stripe rust and R to Leaf rust. It is also MRMS to both Yellow leaf spot and Septoria tritici blotch. It has good grain size and lower screenings consistent with other durum varieties available. DBA Spes[Ⓛ] is eligible for ADR grade in SA and was released from Durum Breeding Australia's Southern Node (University of Adelaide) in 2018 with seed available from the Southern Australia Durum Growers Association. (EPR \$3.00/t GST ex).

DBA Vittaroi^{db}

DBA Vittaroi^{db} is a fast-developing variety, developing at a similar speed to Saintly^{db}. It is MR to leaf, stem and Stripe rust and MRMS to Yellow leaf spot. DBA Vittaroi^{db} has good grain size and low screenings levels consistent with other durum varieties. It is shorter in stature than DBA-Aurora^{db} with good straw strength and tolerance to lodging. DBA Vittaroi^{db} is eligible for ADR grade in SA and was released from Durum Breeding Australia's Northern Node (Tamworth, NSW DPI) in 2017 with seed available from Seednet. (EPR \$3.63/t GST ex).

DBA-Aurora^{db}

DBA-Aurora^{db} is a fast-medium developing variety. It is RMR to stem and strip rust and R to Leaf rust. It is also MRMS to Yellow leaf spot and MS to Septoria tritici blotch. DBA-Aurora^{db} has grain size and screenings levels similar to other varieties available. DBA-Aurora^{db} has also shown good early vigour and grass weed competitiveness. Released in 2014 from the Durum Breeding Australia's Southern Node

(University of Adelaide) and eligible for ADR grade in SA. Seed is available from Southern Australia Durum Growers Association. (EPR \$3.00/t GST ex).

Saintly^{db}

Saintly^{db} is an awnless durum variety, earlier flowering than Kalka and Tamaroi, and has performed very well in dry finishing conditions in SA. Saintly^{db} has slightly less stem and Leaf rust resistance compared to Hyperno^{db}. Saintly^{db} is eligible for ADR grade in SA. (EPR \$3.00/t GST ex).

Westcourt^{db}

Westcourt^{db} has a development speed similar to DBA-Aurora^{db}. It is RMR to stem, stripe and Leaf rust and MRMS to both Yellow leaf spot and Septoria tritici blotch. It has good physical grain quality characteristics with low screenings. Westcourt^{db} is eligible for ADR in SA and was released by AGT in 2019 with seed available through AGT Affiliates, retailers or through Seed Sharing TM. (EPR \$3.50/t GST ex).

TABLE 12 Disease responses of durum wheats and reaction to common disorders.

| Variety | Rust | | | Septoria tritici blotch | Yellow leaf spot | Powdery mildew | Black point | CCN |
|----------------------------|------|--------|------|-------------------------|------------------|----------------|-------------|------|
| | Stem | Stripe | Leaf | | | | | |
| Bitalli ^{db} | MR | RMR | MR | MRMS | MRMS | S | MRMS | MS |
| DBA Artemis ^{db} | MR | RMR | RMR | MRMS | MRMS | MSS | MS | MS |
| DBA-Aurora ^{db} | RMR | RMR | R | MS | MRMS | MR | MSS | MSS |
| DBA Spes ^{db} | RMR | RMR | R | MRMS | MRMS | MS | MS | MRMS |
| DBA Vittaroi ^{db} | MR | MR | MR | MRMS | MRMS | MR | MSS | S |
| Saintly ^{db} | MR | MR | MRMS | S | MRMS | MSS | MS | MS |
| Westcourt ^{db} | RMR | RMR | RMR | MRMS | MRMS | MSS | – | – |

Disease rating codes: R = resistant; MR = moderately resistant; MS = moderately susceptible; S = susceptible; VS = very susceptible; – = variety yet to be fully evaluated.

* Provisional rating based on limited NVT data. Ratings provided are primarily from 2018 and earlier with limited updates based on 2019 data.

Cereal cyst nematode (CCN) resistance refers to the ability of the variety to reduce CCN carryover. Black point is not a disease but is a physiological response to certain humid conditions.

Information on disease reaction was supplied by the Field Crop Pathology Unit (SARDI). Contact Dr Hugh Wallwork: hugh.wallwork@sa.gov.au or Dr Tara Garrard: tara.garrard@sa.gov.au

TABLE 13 Mid North durum wheat yield performance. NVT data 2014–18.

Long-term yield expressed as a percentage of mean yield.

| Variety | Year | 2014 | 2015 | 2016 | 2017 | 2018 |
|----------------------------|-----------------|------|------|------|------|------|
| | Mean yield t/ha | 3.64 | 2.32 | 5.71 | 3.59 | 1.83 |
| | No. trials | 2 | 3 | 2 | 2 | 2 |
| Bitalli ^{db} | 4 | – | – | – | 106 | 117 |
| DBA Artemis ^{db} | 6 | – | – | 110 | 100 | 105 |
| DBA Spes ^{db} | 6 | – | – | 109 | 102 | 106 |
| DBA Vittaroi ^{db} | 6 | 100 | – | – | 109 | 106 |
| DBA-Aurora ^{db} | 11 | 101 | 111 | 109 | 108 | 114 |
| Saintly ^{db} | 11 | 105 | 117 | 96 | 109 | 111 |
| Westcourt ^{db} | 2 | – | – | – | – | 102 |

Legend: Mean variety yield performance

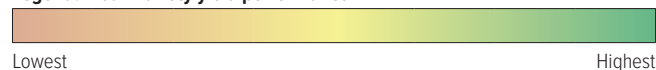


TABLE 14 Yorke Peninsula durum wheat yield performance. NVT data 2014–18.

Long-term yield expressed as a percentage of mean yield.

| Variety | Year | 2014 | 2015 | 2016 | 2017 | 2018 |
|---------------------------|-----------------|------|------|------|------|------|
| | Mean yield t/ha | 3.32 | 2.08 | 5.83 | 3.71 | 4.34 |
| | No. trials | 2 | 3 | 3 | 3 | 2 |
| Bitalli [Ⓛ] | 5 | – | – | – | 108 | 112 |
| DBA Artemis [Ⓛ] | 8 | – | – | 114 | 103 | 103 |
| DBA Spes [Ⓛ] | 8 | – | – | 112 | 103 | 104 |
| DBA Vittaroi [Ⓛ] | 7 | 88 | – | – | 100 | 103 |
| DBA-Aurora [Ⓛ] | 13 | 104 | 118 | 112 | 105 | 109 |
| Saintly [Ⓛ] | 13 | 97 | 119 | 95 | 102 | 103 |
| Westcourt [Ⓛ] | 2 | – | – | – | – | 105 |

Legend: Mean variety yield performance



USEFUL RESOURCES

More information about the overview of wheat production in Australian can be found at AEGIC online: <https://www.aegic.org.au/publications/australian-grains/wheat>.

Information about Australian wheat classification can be found on the Wheat Quality Australia website: <https://wheatquality.com.au>.

Information about the Australian wheat trade and current GTA receival standards can be found on the Grain Trade Australia website: <http://www.graintrade.org.au>.

BARLEY

By Kenton Porker, Courtney Peirce, Tara Garrard, Hugh Wallwork and Phil Davies, SARDI Crop Sciences

This sowing guide provides data and guidance on the most suitable barley varieties for sowing in South Australia in 2020.

Since publication of the 2019 sowing guide, Leabrook[®] has been released and RGT Planet[®] is now an accredited malting variety. New potential varieties Bottler[®] and IGB1705T have not yet been released and are not available for 2020 so are not included in this guide. Bass[®] and Flinders[®] have been removed from the guide.

The decision to grow either a malting, food or feed variety may depend on one or more factors, including:

- market demand and malting varietal storage segregations in bulk storage facilities;
- the difference in payments between malting and feed grades compared to yield differences;
- the likelihood of producing a malting grade barley within malt receival specifications; and
- disease resistance and agronomic considerations.

MARKETING

Growers need to consider which varietal option will lead to the greatest profitability. The relative difference in the price premium paid for malt relative to feed may counteract the yield difference between malt and feed or food varieties. Other scenarios may favour high-yielding feed or food varieties where there is a low probability of achieving malt and a desire for lower input costs. Among malt and food varieties, differential pricing will be a continuing trend, and growers need to consider market premiums and discounts in addition to agronomic performance to maximise profitability. Newer food and malt varieties are now offering good yield potential. Varieties accredited and varieties currently undergoing malt evaluation now have similar yield potential as feed varieties, making it worthwhile for growers to consider including some malting varieties in their cropping program.

It is important that growers contact their grain marketers of choice to discuss market demand prior to sowing a malting variety. Malting barley is grown, stored and sold on a variety-specific basis and it is important to ascertain if the variety chosen is able to be stored and marketed in your area. The preferred Barley Australia list is updated annually as a guide to industry on the market-preferred varieties and can be found online at www.barleyaustralia.com.au. The preferred list is determined by marketing companies and reflects their opinion on which malting varieties will be sought by purchasers of Australian malting barley. In many cases a new variety accreditation does not mean the variety will be a preferred variety until market demand is established. Table 2 lists some of the current released varieties under malt barley evaluation by the Malting and Brewing Industry Barley Technical Committee (MBITC) in conjunction with Pilot Brewing Australia (PBA) and Barley Australia, including the anticipated timeline for accreditation. Accreditation is only granted if the variety satisfies the selection criteria set by MBITC and Barley Australia (see www.barleyaustralia.com.au). Westminster[®], while not yet segregated for malt in SA, has some limited direct marketing opportunities in the South East and into Port Adelaide.

AGRONOMY

Barley varieties differ in development speed (Figure 1). Most commonly grown varieties fall in the fast to medium-development range and are best suited for planting dates after 1 May. In regions of minimal frost risk, varieties can be sown in late April, particularly in shorter season districts defined by terminal moisture and heat-stress events during grain fill. Barley is slightly more frost tolerant than wheat; however, there are a limited number of varieties with a suitable flowering behaviour for sowing before April 25. Urambie[®] is the only winter barley and may be better suited for dual purpose graze and grain from early April planting but has not been included for evaluation in NVT in SA.

TABLE 1 Suitable barley varieties for planting in South Australia.

Listed according to current (2019-20) quality classification grade and alphabetical order, not in order of preference.

| Variety | Suitability and significant features |
|------------------------------|--|
| MALTING | |
| Commander [Ⓛ] | All areas, except areas prone to net form net blotch, risk of lodging in high yielding environments. |
| Compass [Ⓛ] | All areas, at risk with some strains of Leaf rust and lodging in high yielding environments. |
| Granger [Ⓛ] | Medium to high rainfall areas, note limited malting marketing and segregation opportunities in SA. |
| La Trobe [Ⓛ] | All areas, note modest early vigour and weed competitiveness especially in light soils. |
| RGT Planet [Ⓛ] | All areas. Note lower test weights and higher small grain screenings under hot dry finishes and susceptibility to spot form and net form of net blotch. |
| Schooner | All areas except Leaf rust prone areas, now agronomically outclassed, declining industry demand; however, has renewed interest in the craft market. |
| Scope CL [Ⓛ] | All areas except where Leaf rust and CCN is a problem. Imidazolinone tolerant. |
| Spartacus CL [Ⓛ] | All areas, imidazolinone tolerant. Similar competitive characteristics as Hindmarsh [Ⓛ] . |
| Westminster [Ⓛ] | Higher rainfall and longer season areas, segregations available in South East region. |
| FOOD | |
| Hindmarsh [Ⓛ] | All areas, noting modest early vigour and weed competitiveness especially in light soils. |
| FEED | |
| Banks [Ⓛ] | Targeted for medium to high rainfall zones, being evaluated for malt accreditation. |
| Capstan | Medium to high rainfall areas where very high yields are targeted and test weight is easily achieved. |
| Fathom [Ⓛ] | All areas, noting susceptibility to net form net blotch. |
| Fleet Australia [Ⓛ] | All areas, particularly for districts with lower rainfall and light soils noting high net form net blotch risk. |
| Keel | All areas except deep sandy soils of lower fertility and avoid areas prone to Leaf rust. Earliest maturing feed variety. |
| Leabrook [Ⓛ] | All areas, similar plant characteristics as Compass [Ⓛ] , at risk with some strains of Leaf rust and lodging in high yielding environments. Being evaluated for malt accreditation. |
| LG Alestar [Ⓛ] | Targeted for medium to high rainfall zones, being evaluated for malt accreditation. |
| Oxford | Medium to high rainfall areas (>400mm). Early sowing. |
| Rosalind [Ⓛ] | All areas, broadly adapted. |

TABLE 2 Released varieties undergoing malt evaluation and expected timeline (Barley Australia).

| Variety | Year 0 | Stage 1 | Stage 2 | Target decision date |
|-------------------------|-----------------|---------------|------------------|----------------------|
| Banks [Ⓛ] | 2016 (accepted) | 2017 (passed) | 2019 (held over) | November 2019 |
| Leabrook [Ⓛ] | 2017 (accepted) | 2018 (passed) | 2019 | March 2020 |
| LG Alestar [Ⓛ] | 2017 (accepted) | 2018 (passed) | 2019 | March 2020 |

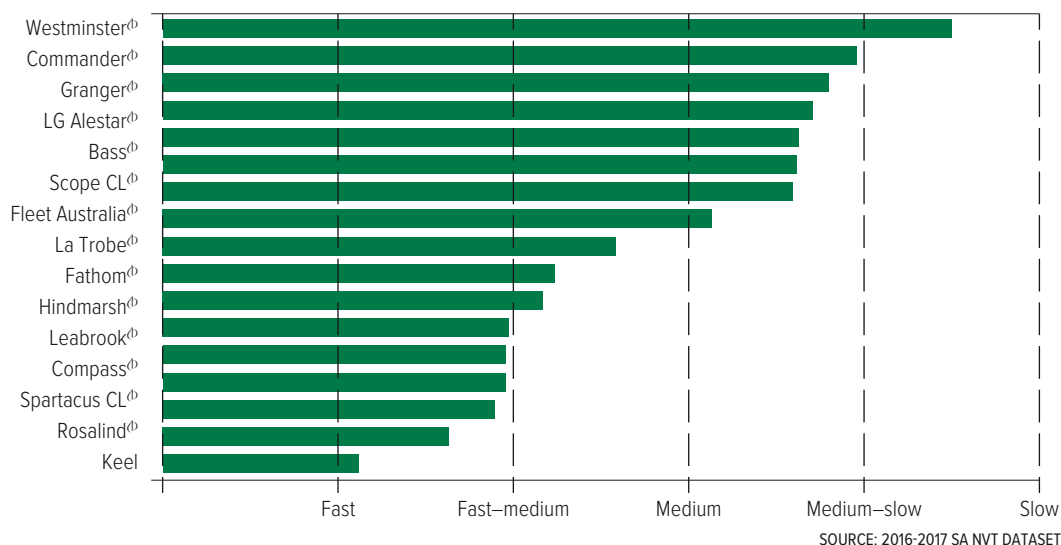


FIGURE 1 Relative speed of development of selected barley varieties sown during May and June across SA. Varieties are ranked according to time to flower.

TABLE 3 Disease reaction of selected barley varieties.

| Variety | CCN | | Leaf rust | Net blotch | | Leaf scald | Powdery mildew | Black point |
|------------------------------|------------|-----------|-----------|------------|-------------|------------|----------------|-------------|
| | Resistance | Tolerance | | (net form) | (spot form) | | | |
| Banks [Ⓛ] | S | T | MS-S | R-MRMS | MS-S | R-SVS | MR-MSS | MRMS |
| Buloke [Ⓛ] | S | T | MS-SVS | MR | MS-S | MS-S | RMR | MS |
| Commander [Ⓛ] | R | T | MS-S | MSS-SVS | MSS | S-SVS | MRMS | MSS |
| Compass [Ⓛ] | R | T | SVS | MR-MSS | MR-MSS | MS-SVS | MRMS | MS |
| Fathom [Ⓛ] | R | T | MRMS-S | MS-VS | RMR | R-MS | MRMS | MSS |
| Fleet Australia [Ⓛ] | R | T | MRMS-S | S-VS | MR | MR-SVS | MRMS | MS |
| Flinders [Ⓛ] | S | T | MRMS-S | MRMS | S | S | RMR | MRMS |
| Granger [Ⓛ] | S | T | MR-MS | MR-MSS | S | MS-SVS | R | MS |
| Hindmarsh [Ⓛ] | R | T | MRMS-S | MR-MSS | S | R-VS | MR-S | MSS |
| Keel | R | T | VS | MS | MR | MS-SVS | S | SVS |
| La Trobe [Ⓛ] | R | T | MRMS-S | MR-MSS | MSS | R-VS | M-S | MSS |
| Leabrook [Ⓛ] | R | T | MS-SVS | MR-S | MS | MS-SVS | MR-MS | MSS |
| LG Alestar [Ⓛ] | - | T | R-MS | MR-S | MSS | MSS-VS | RMR | MRMS |
| Maritime [Ⓛ] | R | T | MRMS-S | R-VS | MRMS | MS-S | SVS | MS |
| Oxford | S | T | R-MS | MR-SVS | S | MR-SVS | R | MRMS |
| RGT Planet [Ⓛ] | R | T | MR-MS | MRMS-SVS | S | R-S | R | MRMS |
| Rosalind [Ⓛ] | R | T | MR | MR | MS-S | MR-SVS | RMR-S | MSS |
| Schooner | VS | T | S-VS | MR | MS | MS-S | SVS | MS |
| Scope CL [Ⓛ] | S | T | MS-SVS | MR | MS-S | MS-S | R-MR | MS |
| Spartacus CL [Ⓛ] | R | T | MR-S | MRMS-S | S | R-VS | MR-S | MSS |
| Westminster [Ⓛ] | - | T | R-MRMS | R-S | S | R-S | R | MRMS |

Disease rating codes: R = resistant; MR = moderately resistant; MS = moderately susceptible; S = susceptible; VS = very susceptible

Ratings provided are primarily from 2017 and have not been updated with new data.

A range of reactions is provided where different strains of the pathogen exist and where the variety may respond differently to them.

Cereal cyst nematode (CCN) tolerance indicates the ability of the variety to grow and yield in the presence of CCN. Resistance refers to the ability of the variety to reduce CCN carryover.

Information on disease reaction was supplied by the Field Crop Pathology Unit (SARDI). Contact Dr Tara Garrard or Dr Hugh Wallwork (08) 8429 2227.

DISEASE

Net form net blotch remains a significant disease threat to barley production across South Australia and growers should refrain from growing barley on barley or planting highly susceptible varieties unless a vigilant fungicide strategy is planned. Newer releases Spartacus CL[Ⓛ] and RGT Planet[Ⓛ] are susceptible to Spot form net blotch and will need an appropriate fungicide strategy.

Cereal cyst nematode levels should be carefully monitored where there is a history of growing susceptible varieties such as Schooner, Scope CL[Ⓛ], Buloke[Ⓛ], Oxford and Gairdner. Seed dressings which have activity on Powdery mildew should be applied to all varieties, susceptible to Powdery mildew. Hindmarsh[Ⓛ], La Trobe[Ⓛ], Spartacus CL[Ⓛ] and Rosalind[Ⓛ] are more susceptible to loose smut than other varieties and an appropriate seed smuticide in addition to foliar control of Powdery mildew should be considered.

VARIETY NOTES

LG Alestar[Ⓛ]

LG Alestar[Ⓛ] is a variety currently undergoing malt accreditation, with a similar maturity to Commander[Ⓛ], and is targeted for the medium to high-rainfall regions of SA. LG Alestar[Ⓛ] has demonstrated a yield improvement compared to Westminster[Ⓛ]. More evaluation is required on its adaptation to SA. Seed is available through Elders and through selected seed partners.

Banks[Ⓛ]

Banks[Ⓛ] is a mid-late maturing barley currently undergoing malting accreditation with a decision delayed until November 2019. Banks[Ⓛ] has been developed by Intergrain and targeted for the medium to high-rainfall environments. Banks[Ⓛ] is rated R-MRMS for net form net blotch resistance and is MS-S to Spot form net blotch. Its long-term yield performance has been four to seven per cent above Commander[Ⓛ] in most SA districts. Seed is available for planting in 2020 from Intergrain Seedclub members and resellers.

Commander[®]

Commander[®] is a malting quality variety released by the University of Adelaide in 2008 and suitable for domestic, Chinese and South-East Asian export brewing markets. Commander[®] has mid-season maturity and across many seasons has demonstrated wide adaptation and very high yield relative to other malting varieties, particularly in seasons with favourable spring finishes. Commander[®] has excellent grain plumpness, but generally has lower test weight relative to La Trobe[®]. Commander[®] is resistant to CCN but is moderately susceptible to most foliar diseases, including net form net blotch. Compared with La Trobe[®], Commander[®] has poor straw strength and is prone to lodging in high-yielding environments and wet spring conditions. Seed is available through Seednet.

Compass[®]

Compass[®] has been developed by the University of Adelaide as an early to mid-season maturing accredited malting quality variety. It is closely related to Commander[®] but is higher yielding. It has a similar growth habit to Commander[®] but is earlier flowering with typical May sowing and improved net form net blotch resistance. Compass[®] has similar straw strength to Commander[®] and is prone to lodging in high-yielding environments. Compass[®] is now susceptible (SVS) to a new strain of Leaf rust in SA. Compass[®] has shown good physical grain quality with high retention and low screenings and low-moderate test weight. Seed is available from Seednet.

Fathom[®]

Fathom[®] is an early-maturing feed quality variety developed using wild barley to improve stress tolerance and water use efficiency. Fathom[®] has averaged very high yields similar to Hindmarsh[®], based on NVT data, since 2010 and shows good early vigour and weed competitiveness. Fathom[®] typically flowers three to four days later than Hindmarsh[®] with early May sowing and flowers similar to Hindmarsh[®] with later sowings. Fathom[®] has good levels of resistance to CCN, Powdery mildew and Spot form net blotch. Fathom[®] has shown susceptibility to net form net blotch, scald and Leaf rust. Seed is available from Seednet.

Granger[®]

Granger[®] is a high-yielding variety accredited for malting in 2013. It is mid maturing and targeted for areas with more than 400mm rainfall. Granger[®] has good levels of resistance to Powdery mildew

and is rated MR-MSS for net form net blotch, variable resistance to Leaf rust and Leaf scald, and susceptibility to Spot form net blotch. Segregation and marketing opportunities for malting are currently limited in SA. Seed is available from Heritage Seeds.

Hindmarsh[®]

Hindmarsh[®] is an early-maturing, semi-dwarf, food quality variety developed by VicDPI and released in 2006. Hindmarsh[®] offers excellent yield potential and grain quality with resistance to CCN, variable resistance to Leaf rust and Leaf scald and susceptibility to Spot form net blotch. In 2016 it became MS to net form net blotch in some areas. Hindmarsh[®] has slow early growth and a short coleoptile, and attention to seeding depth is important in stubble-retained systems. Where triadimenol seed dressing and pre-emergent herbicide is used, research has shown shallow sowing with increased seed rates to be more advantageous than deeper sowing to avoid potential damage. Seed is available from Seednet.

La Trobe[®]

La Trobe[®] is a malting-accredited variety released from Intergrain in 2014 with early maturity and semi-dwarf growth habit and plant architecture very similar to Hindmarsh[®]. Its yield and agronomic performance in SA NVT since 2013 has also been very similar to Hindmarsh[®] with slightly higher yield. La Trobe[®] is resistant to CCN but susceptible to Spot form net blotch and rated moderately resistant to moderately susceptible to net form net blotch but shows variable resistance to Leaf rust and Leaf scald. La Trobe[®] seed is approved for grower to grower trading and seed is available through Intergrain Seedclub members.

Leabrook[®]

Leabrook[®] is a new variety released in 2019 and has been developed by the University of Adelaide as an early to mid-season developing variety. It is currently undergoing evaluation for malt accreditation. It is closely related to Compass[®] but NVT results suggest it is higher yielding. It has a similar growth habit to Compass[®] and similar flowering behaviour with typical May sowing. Leabrook[®] has similar straw strength to Compass[®] and will be prone to lodging in high-yielding environments. Leabrook[®] is MS-SVS to Leaf rust in SA. Leabrook[®] has shown good physical grain quality with high retention and low screenings and low-moderate test weight. Seed is available from Seednet.

Oxford

Oxford is a feed-quality variety which has shown very high yield potential in seasons with high spring rainfall. Oxford can be sown in mid to late-April scenarios. Oxford has late maturity, good straw strength and low shattering. While Oxford is susceptible to CCN, Leaf scald and Spot form net blotch, it has good resistance to Leaf rust and Powdery mildew. It is also now very susceptible to some strains of net form net blotch. Seed is available through Heritage Seeds.

RGT Planet[®]

RGT Planet[®] is a direct introduction from Europe bred by RGT seeds. RGT Planet[®] is now an accredited malt variety in Australia. RGT Planet[®] is a mid-season flowering variety, similar to Commander[®] or slightly earlier from May sowing dates. RGT Planet[®] has shown the highest potential yield compared to other available barley varieties, particularly in the medium to high-rainfall zones. RGT Planet[®] is susceptible to spot and net form net blotch. Quality data suggests RGT Planet[®] has a lower test weight than Commander[®] and has a greater tendency for small grain screening under sub-optimal grain fill conditions. Seed is available via Seed Force broadacre commercial partners.

Rosalind[®]

Rosalind[®] is a feed-quality variety released by Intergrain in 2015. It has been evaluated in SA NVT since 2014 and has demonstrated broad adaptation to low-yielding environments and very high relative yields in high-rainfall environments. Rosalind[®] has a Hindmarsh[®] plant type and is slightly faster to develop than Hindmarsh[®] when sown in May. Rosalind[®] has excellent straw strength and standability. Rosalind[®] has resistance to CCN, net form net blotch, Leaf rust, and variable resistance to Powdery mildew and Leaf scald but susceptibility to Spot form net blotch. Rosalind[®] seed is approved for grower to grower trading and seed is available through Intergrain Seedclub members.

Scope CL[®]

Scope CL[®] is a tall, malting-quality, mid-season maturing, imidazolinone-tolerant barley with moderate to high-yield potential across a range of medium-rainfall environments. Its disease resistance profile is very similar to Buloke[®] with susceptibility to some strains of Leaf rust but good resistance to net form net blotch and Powdery mildew. Scope CL[®] has registration for use with an appropriate BASF Clearfield[®] herbicide, and this herbicide tolerance makes Scope CL[®] an attractive option for brome and other grass control, particularly in Mallee-type soils. Seed is available through Seednet.

Spartacus CL[®]

Spartacus CL[®] is a malting accredited imidazolinone-tolerant barley developed by Intergrain and released in 2016 with a similar plant type and flowering behaviour to Hindmarsh[®] and La Trobe[®]. Within SA NVT during 2014–17, Spartacus CL[®] has also exhibited similar agronomic performance for grain yield and disease resistance profile including resistance to CCN and susceptibility to loose smut. It has shown increased susceptibility to net form net blotch in 2019. Yields have averaged similar to Compass[®] across most districts and slightly higher in higher yielding districts. Spartacus CL[®] has consistently averaged more than 15 per cent above the widely grown imidazolinone-tolerant Scope CL[®] and has improved grain size. Seed is available for sowing from local resellers and Intergrain Seedclub members.

Westminster[®]

Westminster[®] is a mid to late-maturing variety with medium-tall, stiff straw. Malting accreditation was completed in March 2013. Westminster[®] now shows variable resistance to net form net blotch and Leaf scald, has good resistance to black point but is susceptible to Spot form net blotch. Westminster[®] is well suited to the SE of SA and higher rainfall environments. Contact GrainSearch for details on obtaining seed for 2020.

YIELD PERFORMANCE EXPERIMENTS 2014–18

The yield results presented are multi-environment trial (MET) data shown on a yearly regional group mean and a weighted regional mean. All yields are expressed as a percentage of mean yield from NVT data 2014 to 2018 inclusive, along with number of observations in adjacent columns.

Further results can be found on the NVT website: www.nvtonline.com.au.

TABLE 4 Lower Eyre Peninsula barley yield performance. NVT data 2014–18.

Long-term yield expressed as a percentage of mean yield.

| Variety | Year | 2014 | 2015 | 2016 | 2017 | 2018 |
|-----------------------------------|-----------------|------|------|------|------|------|
| | Mean yield t/ha | 3.74 | 4.02 | 4.96 | 3.29 | 5.96 |
| | No. trials | 3 | 3 | 3 | 3 | 2 |
| MALTING | | | | | | |
| Commander ^{db} | 14 | 101 | 97 | 104 | 101 | 99 |
| Compass ^{db} | 14 | 110 | 115 | 99 | 109 | 103 |
| Gairdner | 14 | 89 | 90 | 86 | 90 | 90 |
| Granger ^{db} | 14 | 97 | 98 | 98 | 97 | 100 |
| La Trobe ^{db} | 14 | 107 | 111 | 100 | 107 | 103 |
| RGT Planet ^{db} | 8 | – | – | 111 | 107 | 111 |
| Scope CL ^{db} | 14 | 98 | 98 | 96 | 98 | 97 |
| Spartacus CL ^{db} | 14 | 110 | 114 | 101 | 109 | 104 |
| Westminster ^{db} | 12 | 88 | 85 | 94 | 88 | – |
| FOOD | | | | | | |
| Hindmarsh ^{db} | 14 | 108 | 113 | 99 | 108 | 103 |
| FEED | | | | | | |
| Fathom ^{db} | 14 | 105 | 106 | 102 | 106 | 102 |
| Fleet Australia ^{db} | 14 | 100 | 98 | 101 | 101 | 98 |
| Keel | 14 | 103 | 106 | 95 | 103 | 99 |
| Oxford | 14 | 93 | 90 | 102 | 93 | 99 |
| Rosalind ^{db} | 14 | 112 | 117 | 107 | 112 | 110 |
| PENDING MALT ACCREDITATION | | | | | | |
| Banks ^{db} | 11 | – | 107 | 105 | 106 | 105 |
| Buff ^{db} | 2 | – | – | – | – | 102 |
| Leabrook ^{db} | 11 | – | 113 | 107 | 111 | 106 |
| LG Alestar ^{db} | 14 | 98 | 98 | 101 | 98 | 101 |

TABLE 5 Upper Eyre Peninsula barley yield performance. NVT data 2014–18.

Long-term yield expressed as a percentage of mean yield.

| Variety | Year | 2014 | 2015 | 2016 | 2017 | 2018 |
|-----------------------------------|-----------------|------|------|------|------|------|
| | Mean yield t/ha | 3.17 | 2.49 | 3.98 | 2.16 | 2.18 |
| | No. trials | 4 | 4 | 4 | 2 | 4 |
| MALTING | | | | | | |
| Commander ^{db} | 18 | 102 | 99 | 101 | 104 | 107 |
| Compass ^{db} | 18 | 116 | 119 | 101 | 119 | 120 |
| La Trobe ^{db} | 18 | 112 | 114 | 102 | 114 | 115 |
| RGT Planet ^{db} | 10 | – | – | 113 | 96 | 98 |
| Scope CL ^{db} | 18 | 97 | 98 | 97 | 102 | 101 |
| Spartacus CL ^{db} | 18 | 116 | 117 | 99 | 116 | 116 |
| FOOD | | | | | | |
| Hindmarsh ^{db} | 18 | 113 | 116 | 100 | 115 | 115 |
| FEED | | | | | | |
| Fathom ^{db} | 18 | 110 | 112 | 110 | 113 | 118 |
| Fleet Australia ^{db} | 18 | 103 | 103 | 106 | 110 | 115 |
| Keel | 18 | 106 | 109 | 101 | 113 | 114 |
| Rosalind ^{db} | 18 | 120 | 121 | 108 | 111 | 113 |
| PENDING MALT ACCREDITATION | | | | | | |
| Banks ^{db} | 14 | – | 109 | 104 | 106 | 107 |
| Buff ^{db} | 4 | – | – | – | – | 115 |
| Leabrook ^{db} | 14 | – | 118 | 105 | 116 | 119 |
| LG Alestar ^{db} | 18 | 96 | 95 | 98 | 91 | 89 |

TABLE 6 Mid North barley yield performance. NVT data 2014–18.

Long-term yield expressed as a percentage of mean yield.

| Variety | Year | 2014 | 2015 | 2016 | 2017 | 2018 |
|-----------------------------------|-----------------|------|------|------|------|------|
| | Mean yield t/ha | 4.95 | 3.34 | 6.68 | 4.91 | 2.53 |
| | No. trials | 3 | 3 | 3 | 3 | 2 |
| MALTING | | | | | | |
| Commander ^{db} | 14 | 98 | 99 | 97 | 100 | 104 |
| Compass ^{db} | 14 | 110 | 117 | 94 | 106 | 126 |
| Flinders ^{db} | 14 | 97 | 95 | 96 | 96 | 92 |
| Gairdner | 14 | 92 | 88 | 90 | 92 | 89 |
| Granger ^{db} | 14 | 99 | 96 | 102 | 98 | 89 |
| La Trobe ^{db} | 14 | 107 | 113 | 97 | 104 | 118 |
| RGT Planet ^{db} | 8 | – | – | 121 | 109 | 101 |
| Scope CL ^{db} | 14 | 98 | 98 | 94 | 98 | 101 |
| Spartacus CL ^{db} | 14 | 109 | 115 | 95 | 104 | 119 |
| Westminster ^{db} | 12 | 90 | 82 | 99 | 92 | – |
| FOOD | | | | | | |
| Hindmarsh ^{db} | 14 | 108 | 114 | 95 | 104 | 119 |
| FEED | | | | | | |
| Explorer ^{db} | 14 | 103 | 103 | 108 | 101 | 94 |
| Fathom ^{db} | 14 | 105 | 110 | 103 | 107 | 123 |
| Fleet Australia ^{db} | 14 | 99 | 102 | 98 | 103 | 116 |
| Keel | 14 | 104 | 108 | 95 | 103 | 120 |
| Oxford | 11 | 93 | 87 | – | 95 | 75 |
| Rosalind ^{db} | 14 | 112 | 119 | 108 | 109 | 118 |
| PENDING MALT ACCREDITATION | | | | | | |
| Banks ^{db} | 11 | – | 108 | 103 | 104 | 108 |
| Buff ^{db} | 2 | – | – | – | – | 116 |
| Leabrook ^{db} | 11 | – | 116 | 99 | 107 | 121 |
| LG Alestar ^{db} | 14 | 98 | 96 | 103 | 98 | 87 |

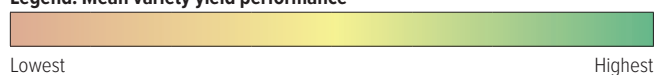
Legend: Mean variety yield performance

TABLE 7 Yorke Peninsula barley yield performance. NVT data 2014–18.

Long-term yield expressed as a percentage of mean yield.

| Variety | Year | 2014 | 2015 | 2016 | 2017 | 2018 |
|-----------------------------------|-----------------|------|------|------|------|------|
| | Mean yield t/ha | 4.32 | 3.25 | 6.36 | 4.69 | 5.05 |
| | No. trials | 5 | 5 | 5 | 5 | 3 |
| MALTING | | | | | | |
| Commander [Ⓛ] | 23 | 102 | 102 | 100 | 100 | 98 |
| Compass [Ⓛ] | 23 | 107 | 117 | 96 | 101 | 104 |
| Gairdner | 23 | 89 | 86 | 91 | 94 | 93 |
| Granger [Ⓛ] | 23 | 96 | 94 | 100 | 98 | 98 |
| La Trobe [Ⓛ] | 23 | 105 | 113 | 98 | 101 | 103 |
| RGT Planet [Ⓛ] | 13 | – | – | 116 | 110 | 111 |
| Scope CL [Ⓛ] | 23 | 98 | 98 | 96 | 98 | 98 |
| Spartacus CL [Ⓛ] | 23 | 106 | 115 | 96 | 99 | 102 |
| Westminster [Ⓛ] | 20 | 89 | 81 | 97 | 96 | – |
| FOOD | | | | | | |
| Hindmarsh [Ⓛ] | 23 | 105 | 113 | 97 | 100 | 103 |
| FEED | | | | | | |
| Explorer [Ⓛ] | 18 | – | 99 | 104 | 102 | 103 |
| Fathom [Ⓛ] | 23 | 108 | 113 | 105 | 107 | 108 |
| Fleet Australia [Ⓛ] | 23 | 104 | 106 | 102 | 104 | 103 |
| Keel | 23 | 103 | 109 | 97 | 101 | 103 |
| Oxford | 18 | 94 | 85 | – | 99 | 96 |
| Rosalind [Ⓛ] | 23 | 111 | 117 | 107 | 106 | 110 |
| PENDING MALT ACCREDITATION | | | | | | |
| Banks [Ⓛ] | 18 | – | 108 | 103 | 103 | 104 |
| Buff [Ⓛ] | 3 | – | – | – | – | 104 |
| Leabrook [Ⓛ] | 18 | – | 117 | 101 | 103 | 104 |
| LG Alestar [Ⓛ] | 23 | 97 | 94 | 101 | 99 | 98 |

TABLE 8 Murray Mallee barley yield performance. NVT data 2014–18.

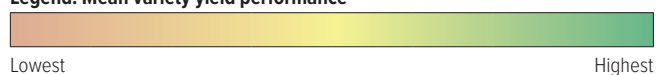
Long-term yield expressed as a percentage of mean yield.

| Variety | Year | 2014 | 2015 | 2016 | 2017 | 2018 |
|-----------------------------------|-----------------|------|------|------|------|------|
| | Mean yield t/ha | 2.44 | 1.58 | 5.54 | 3.66 | 3.16 |
| | No. trials | 3 | 2 | 2 | 1 | 1 |
| MALTING | | | | | | |
| Commander [Ⓛ] | 9 | 95 | 95 | 100 | 103 | 106 |
| Compass [Ⓛ] | 9 | 120 | 123 | 99 | 97 | 101 |
| Granger [Ⓛ] | 5 | 97 | 94 | – | – | – |
| La Trobe [Ⓛ] | 9 | 114 | 117 | 100 | 99 | 102 |
| RGT Planet [Ⓛ] | 4 | – | – | 117 | 112 | 109 |
| Schooner | 8 | 96 | 96 | 83 | 86 | – |
| Scope CL [Ⓛ] | 9 | 99 | 99 | 95 | 95 | 97 |
| Spartacus C [Ⓛ] | 9 | 116 | 117 | 102 | 101 | 102 |
| FOOD | | | | | | |
| Hindmarsh [Ⓛ] | 9 | 117 | 118 | 100 | 99 | 100 |
| FEED | | | | | | |
| Fathom [Ⓛ] | 9 | 111 | 119 | 101 | 99 | 105 |
| Fleet Australia [Ⓛ] | 9 | 101 | 107 | 97 | 97 | 104 |
| Keel | 9 | 112 | 117 | 94 | 93 | 98 |
| Oxford | 9 | 84 | 80 | 103 | 104 | 99 |
| Rosalind [Ⓛ] | 9 | 120 | 123 | 111 | 107 | 106 |
| PENDING MALT ACCREDITATION | | | | | | |
| Banks [Ⓛ] | 6 | – | 109 | 106 | 104 | 105 |
| Buff [Ⓛ] | 1 | – | – | – | – | 108 |
| Leabrook [Ⓛ] | 6 | – | 116 | 106 | 106 | 108 |

TABLE 9 South East barley yield performance. NVT data 2014–18.

Long-term yield expressed as a percentage of mean yield.

| Variety | Year | 2014 | 2015 | 2016 | 2017 | 2018 |
|-----------------------------------|-----------------|------|------|------|------|------|
| | Mean yield t/ha | 3.05 | 1.62 | 6.12 | 5.30 | 5.32 |
| | No. trials | 2 | 2 | 2 | 2 | 2 |
| MALTING | | | | | | |
| Commander ^{db} | 10 | 101 | 97 | 101 | 99 | 101 |
| Compass ^{db} | 10 | 116 | 139 | 93 | 100 | 102 |
| Gairdner | 8 | 93 | 87 | 88 | 90 | – |
| Granger ^{db} | 10 | 95 | 92 | 101 | 102 | 100 |
| La Trobe ^{db} | 10 | 112 | 128 | 96 | 101 | 102 |
| Navigator | 10 | 88 | 64 | 103 | 95 | 96 |
| RGT Planet ^{db} | 6 | – | – | 117 | 111 | 108 |
| Scope CL ^{db} | 10 | 100 | 101 | 95 | 96 | 97 |
| Spartacus CL ^{db} | 10 | 113 | 134 | 95 | 102 | 104 |
| Westminster ^{db} | 10 | 85 | 67 | 99 | 96 | 94 |
| FOOD | | | | | | |
| Hindmarsh ^{db} | 10 | 113 | 132 | 94 | 101 | 102 |
| FEED | | | | | | |
| Capstan | 10 | 93 | 78 | 109 | 101 | 100 |
| Explorer ^{db} | 10 | 98 | 100 | 105 | 105 | 102 |
| Fathom ^{db} | 10 | 111 | 118 | 101 | 98 | 101 |
| Fleet Australia ^{db} | 9 | 106 | 104 | 99 | 95 | 99 |
| Keel | 8 | 111 | 122 | – | 95 | 98 |
| Oxford | 10 | 85 | 69 | 107 | 103 | 100 |
| Rosalind ^{db} | 10 | 113 | 130 | 106 | 108 | 107 |
| PENDING MALT ACCREDITATION | | | | | | |
| Banks ^{db} | 8 | – | 113 | 103 | 104 | 104 |
| Buff ^{db} | 2 | – | – | – | – | 102 |
| Leabrook ^{db} | 8 | – | 129 | 101 | 104 | 106 |
| LG Alestar ^{db} | 2 | – | – | – | – | 101 |

Legend: Mean variety yield performance

GRAIN QUALITY PERFORMANCE TRENDS

Grain quality for individual varieties vary from site to site and from year to year, however, long-term trends highlight varieties that can consistently achieve either higher test weights, low grain screenings or high grain retention under a wider range of environments. Figures 2 to 4 aim to demonstrate variety trends in key grain quality traits.

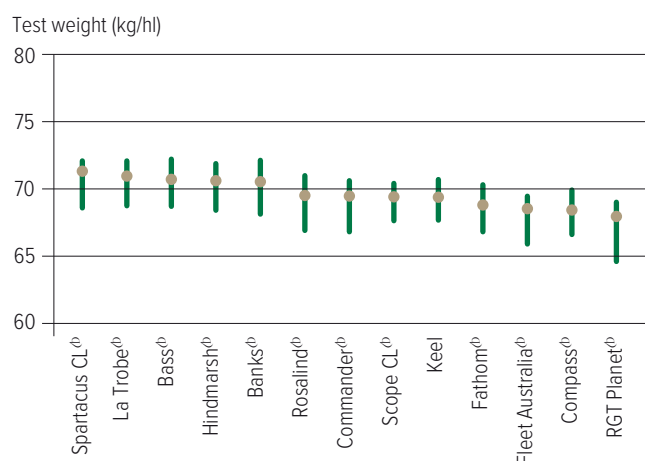


FIGURE 2 The median test weight of varieties in NVT trials 2016-2017 (see circle on each bar). Varieties are ranked in descending order of grain test weight based on the median value. The bars represent the range in which test weights have occurred in 50 per cent of trials. The shorter the bar the more consistent the variety.

The varieties Spartacus CL[®], La Trobe[®], Bass[®], Hindmarsh[®] and Banks[®] all maintain relatively high and consistent test weights. Whereas Fathom[®], Fleet Australia[®] and Compass[®] all trend lower and RGT Planet[®] has the lowest test weight in this dataset.

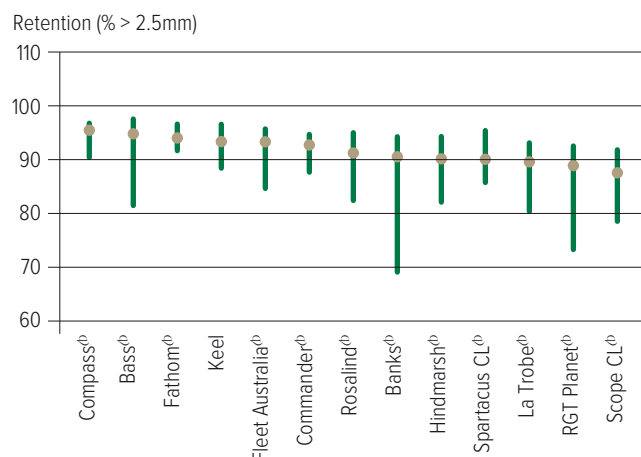


FIGURE 3 The median grain retention of varieties in NVT trials 2016-2017 (see circle on each bar). Varieties are ranked in descending order of grain retention based on the median value. The bars represent the range in which grain retention have occurred in 50 per cent of trials. The shorter the bar the more consistent the variety.

The varieties Compass[®] and Bass[®] are the plumpiest varieties; however, Compass[®] is more consistent. Bass[®], Banks[®] and RGT Planet[®] were the most variable in grain plumpness.

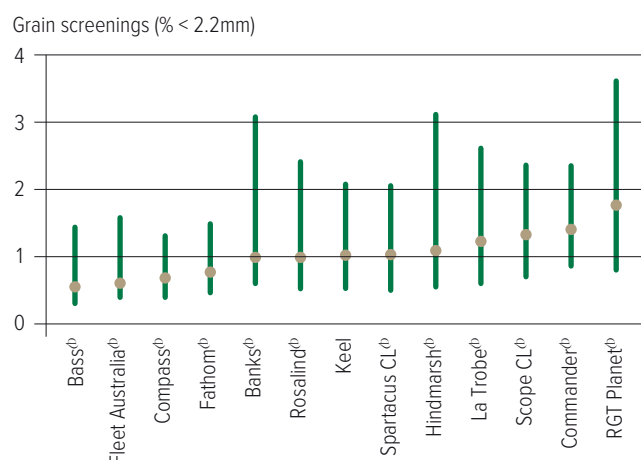


FIGURE 4 The median grain screenings of varieties in NVT trials 2016-2017 (see circle on each bar). Varieties are ranked in increasing order of grain screenings based on the median value. The bars represent the range in which grain screenings have occurred in 50 per cent of trials. The shorter the bar the more consistent the variety.

The varieties Bass[®], Fleet Australia[®], Compass[®] and Fathom[®] have consistently low grain screenings. RGT Planet[®] has trended higher for grain screenings and is the most variable. While not included in these figures, Leabrook[®] has similar grain quality trends as Compass[®].

CANOLA

By Andrew Ware, EPAG Research

Since the publication of the 2019 Canola Variety Sowing Guide, several new canola varieties will be available for production in 2020. Of these, ATR Flathead is a new open pollinated triazine-tolerant (TT) variety and Seed Force advises it will have several new hybrid TT varieties and one new hybrid Clearfield® variety released in 2019, but at the time of writing these have not been named. Cargill/AWB have released one hybrid Clearfield® variety with grain suitable for use as a specialty oil and market in a closed loop. There may be further variety releases in the months to follow, with seed possibly being available for planting in 2020, but these can't be confirmed at this time.

It should be noted that the marketing company responsible for each of the varieties listed in this document has advised that they are planning to have seed available for each of these varieties for planting in 2020, but not all varieties that are still marketed have been tested in NVT in 2019. Some older varieties have not been evaluated in NVT for several years, but seed remains available. Several new varieties are only being evaluated in NVT for the first time in 2019 and no NVT yield data for these varieties is currently available.

There are two groups of NVT canola trials conducted in South Australia, mid-season and early-season series. Both sets of trials have similar sowing and harvest times and have a similar complement of varieties, although there may be several early-maturity varieties in the early series that are not tested in the mid series, or vice versa. The main difference between the series is that the trials are located in areas suited to their maturity, with the majority of the early series in the lower rainfall zone and the mid-season in the medium to high-rainfall zones.

Seeding rates of NVT are adjusted to target 40 plants per square metre in early maturity trials

and 50 plants/m² in mid-maturity trials.

All NVT canola trials are treated with flutriafol in-furrow fungicide placed on fertiliser at sowing for the control of blackleg disease.

Agronomic and disease information for selected varieties is summarised in Table 1, and Tables 2 to 9 summarise relative yield results from NVT in different regions.

SPECIALITY TYPES

A number of specialty oil canola varieties are available for production in South Australia. These include the Victory® varieties (marketed by AWB/Cargill) and Monola® varieties (marketed by Nuseed). These varieties have a different oil profile to commodity canola that is more suitable for use in the food industry. Agronomically, speciality canola is the same as commodity canola. Speciality canola is being offered to growers in closed loop marketing systems, attracting a significant premium price. Production contracts for these varieties are available in the South East and Mid North regions.

WINTER TYPE/GRAIN 'N' GRAZE CANOLA

A number of winter type canola varieties are currently available. These varieties have a high vernalisation (or cold) requirement, which means they are capable of producing high quantities of biomass before they commence flowering and make use of extended growing seasons. This enables them to be grazed over a relatively large window with often little damage to grain yield. These varieties are not evaluated in NVT; however, they are suited to some environments that have a long growing season, such as the lower South East and Kangaroo Island, or in situations where growers are looking to utilise either spring, summer or early autumn rainfall events. They include Hyola® 970CL, Edimax CL and Phoenix CL – all Clearfield® tolerant types.

TABLE 1 Agronomic and disease information of selected canola: triazine tolerant, imidazolinone tolerant and conventional varieties.

| Variety | Licensee | Release year | Type^ | Phenology** | Maturity | Blackleg resistance | | |
|---------------------------|----------------|--------------|-----------|-------------|----------|---------------------|-----------|-----------|
| | | | | | | (bare) | (+Jockey) | Group |
| TRIAZINE TOLERANT | | | | | | | | |
| ATR Bonito [Ⓓ] | Nuseed | 2013 | OP | Mid-fast | E-EM | MS | MR | A |
| ATR Mako [Ⓓ] | Nuseed | 2015 | OP | Mid-fast | EM | MR-MS | R-MR | A |
| ATR-Stingray [Ⓓ] | Nuseed | 2011 | OP | Fast | E | MR-MS | R-MR | C |
| ATR Wahoo [Ⓓ] | Nuseed | 2013 | OP | Mid-slow | ML | MS | R-MR | A |
| DG 670TT | Seednet | 2017 | Hybrid | Mid | ML | MR | R | BF |
| Hyola® 350TT | Pacific Seeds | 2017 | Hybrid | Fast | E | R | — | ABDF |
| Hyola® 550TT | Pacific Seeds | 2018 | Hybrid | Mid-fast | M | R-MR | — | ABDF |
| Hyola® 559TT | Pacific Seeds | 2012 | Hybrid | Mid | M | MR | R | ABD |
| Hyola® 580CT*** | Pacific Seeds | 2018 | Hybrid | Fast | EM | R | R | BC |
| Hyola® 650TT | Pacific Seeds | 2014 | Hybrid | — | ML | R | — | ABD |
| HyTtec Trident | Nuseed | 2019 | Hybrid | Mid-fast | E | R | R | ABDF |
| HyTtec Trophy | Nuseed | 2017 | Hybrid | Mid | E-EM | R-MR | R | ABD |
| InVigor® T 3510 | BASF | 2018 | Hybrid | Fast | E | MS | MR | BF |
| InVigor® T 4510 | BASF | 2016 | Hybrid | Mid-fast | EM | MR-MS | R-MR | BF |
| Monola® 515 TT | Nuseed | 2015 | Spec. Oil | — | | MR | R | Different |
| Pioneer® 44T02 TT | Pioneer Brand | 2016 | Hybrid | Mid-fast | EM | R-MR | R | ABD |
| Pioneer® 45T03 TT | Pioneer Brand | 2018 | Hybrid | Mid-fast | M | R-MR | — | ABD |
| SF Ignite TT | Seed Force | 2017 | Hybrid | Mid-slow | M-ML | MR | R-MR | BF |
| SF Spark TT | Seed Force | 2018 | Hybrid | Fast | E | R-MR | R | ABDF |
| SF Turbine TT | Seed Force | 2016 | Hybrid | Mid | EM | MR-MS | R-MR | BF |
| IMIDAZOLINONE TOLERANT | | | | | | | | |
| Banker CL | Heritage Seeds | 2012 | Hybrid | Mid-fast | M | MR | R | A |
| Hyola® 575CL | Pacific Seeds | 2010 | Hybrid | — | M | R | — | BF |
| Hyola® 970CL | Pacific Seeds | | Hybrid | Winter | Winter | R | — | H |
| Phoenix CL | AGF Seeds | 2018 | Hybrid | Winter | Winter | R | — | B |
| Pioneer® 43Y92 (CL) | Pioneer Brand | 2017 | Hybrid | Mid-fast | E | R-MR | — | B |
| Pioneer® 44Y90 (CL) | Pioneer Brand | 2016 | Hybrid | Mid-fast | EM | R-MR | — | B |
| Pioneer® 45Y91 (CL) | Pioneer Brand | 2016 | Hybrid | Mid | M | MR | — | B |
| Pioneer® 45Y93 (CL) | Pioneer Brand | 2018 | Hybrid | — | M | R-MR | — | BC |
| Saintly CL | Heritage Seeds | 2017 | Hybrid | — | M | MR | R | B |
| SF Edimax CL | Seed Force | | Hybrid | Winter | Winter | R-MR | — | C |
| Victory® V7001CL | Cargill/AWB | 2016 | Spec. Oil | Slow | L | R-MR | R | ABF |
| Victory® V7002CL | Cargill/AWB | 2018 | Spec. Oil | — | EM | MR | R | ABF |
| Victory® V75-03CL | Cargill/AWB | 2019 | Spec. Oil | — | M | — | R | AB* |
| CONVENTIONAL | | | | | | | | |
| AV Garnet | Nuseed | 2007 | OP | Mid | M | MS | MR | A |
| Nuseed Diamond | Nuseed | 2013 | Hybrid | Fast | E | MR | R | ABF |
| Nuseed Quartz | Nuseed | 2017 | Hybrid | Mid | M | R | R | ABD |
| Victory® V3002 | Cargill/AWB | 2012 | Spec. Oil | — | M | R-MR | R | ABF |

[^]Type: OP = Open Pollinated, Spec. Oil = High Stability Specialty Oil.

^{**} Phenology = time to start of flowering in crops established early (before 20 April). Data source GRDC Optimised Canola Profitability Project.

Maturity: E = early, M = mid, L = late. Data source canola breeding companies.

Blackleg rating key: R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible. Data source GRDC Blackleg Management Guide.

Jockey® seed dressing contains fluquinconazole.

Blackleg resistance group refers to the combinations of blackleg resistance genes carried by each variety. Data source GRDC Blackleg Management Guide.

^{***} Hyola 580CT is tolerant to both triazine and imidazolinone herbicide chemistries.

* Provisional rating.

STACKED HERBICIDE TOLERANCE

In 2019 the first variety with stacked herbicide tolerance (tolerance to at least two modes of action herbicides) became available in South Australia, with the release of Hyola® 580CT (tolerant to both triazine and imidazolinone herbicides).

VARIETAL SELECTION

The selection of the most suitable canola variety for a particular situation needs consideration of maturity, herbicide tolerance, blackleg resistance, relative yield, oil content and early vigour.

- The weed species expected may dictate the need for a herbicide-tolerant production system (e.g. triazine tolerant or Clearfield® or Roundup Ready®/rulex). It should be noted that a triazine-tolerant variety will incur a yield and oil penalty when grown in situations where they are not warranted.
- Blackleg has the potential to be a very destructive disease in canola and its management through varietal selection, fungicides and cultural practices are important in maximising yield potential. Varietal blackleg resistance and/or fungicide use should be considered, particularly when rotations are close.
- Recent research has found that early-seeding canola has the potential to maximise water use efficiency. If canola is planted earlier than the traditional window of late April to early May, it is important to consider matching the variety's flowering time with the early seeding date, so that biomass is maximised, and frost and heat risk are minimised. To do this, planting fast-flowering varieties in the medium and high-rainfall areas in early to mid-April should be avoided.

TRIAZINE-TOLERANT VARIETIES

ATR Bonito[Ⓛ]

Early to mid-season maturing open-pollinated variety. Short-medium height. Suited to low-medium rainfall areas. Blackleg resistance rating of MS (resistance group A). Tested in NVT 2012–18. Marketed by Nuseed. (EPR \$5.00/t ex GST).

ATR Flathead – new release

Early maturing open pollinated variety. Replacement for ATR-Stingray[Ⓛ]. Short-medium height. Suited to low-medium rainfall areas. Blackleg resistance rating of MR (resistance group unknown). Tested in NVT trials 2018-19. Marketed by Nuseed. (EPR \$5.00/t ex GST)

ATR Mako[Ⓛ]

Early-mid maturity triazine-tolerant open-pollinated variety. Medium plant height. Suited to medium-high rainfall areas. Blackleg resistance rating of MR-MS (resistance group A). Tested in NVT 2013–18. Marketed by Nuseed Pty Ltd. (EPR \$5.00/t ex GST).

ATR-Stingray[Ⓛ]

Early-maturing open-pollinated variety. Fast to flowering. Short height. Blackleg resistance rating of MR-MS (resistance group C). Tested in NVT 2011–18. Bred by Nuseed Pty Ltd and DPI Victoria. Marketed by Nuseed Pty Ltd.

ATR Wahoo[Ⓛ]

Mid-maturity open-pollinated variety. Medium plant height. Blackleg rating of MS (resistance group A). Suited to medium-high rainfall areas. Tested in NVT 2012–17. Marketed by Nuseed. (EPR \$5.00/t ex GST).

DG 670TT

A mid-late maturity triazine-tolerant hybrid. Medium to tall plant height. Suited to medium-high rainfall areas. Blackleg resistance of MR (resistance group BF). Tested in NVT in 2016–19. Marketed by Landmark and Seednet.

Hyola® 350TT

Early-maturing hybrid. Medium to medium-short plant height. Suited to low-medium rainfall zones. Blackleg resistance rating of R (resistance groups ABDF). Tested in NVT in 2016–19. Bred and marketed by Pacific Seeds.

Hyola® 550TT

Mid-early maturing triazine-tolerant hybrid. Medium plant height. Suited to medium-high-rainfall areas. Blackleg resistance rating R-MR, (resistance groups ABDF). Tested in NVT 2018-19. Bred and marketed by Pacific Seeds.

Hyola® 559TT

Mid-early maturing hybrid. Medium plant height. Suited to low-medium through to high rainfall areas. Blackleg resistance rating of MR, (resistance groups ABD). Tested in NVT trials in 2012–19. Bred and marketed by Pacific Seeds.

Hyola® 650TT

Mid to mid-late maturing hybrid. Medium-tall plant height. Suited to medium-high rainfall areas. Blackleg resistance rating of R (resistance groups ABD). Tested in NVT in 2013–18. Bred and marketed by Pacific Seeds.

TABLE 2 Lower Eyre Peninsula mid-season canola.

| TRIAZINE TOLERANT | | | | | | |
|----------------------------|-----------------|-----------|------|------|----------|-----------|
| Variety | Year | 2014 | 2015 | 2016 | 2017 | 2018 |
| | Mean yield t/ha | 1.87 | 2.06 | 2.64 | | |
| | No. trials | 2 | 2 | 1 | | |
| ATR Bonito ^{db} | 3 | – | 100 | 100 | Not sown | Abandoned |
| ATR Mako ^{db} | 5 | 98 | 100 | 94 | | |
| ATR-Stingray ^{db} | 2 | 95 | – | – | | |
| ATR Wahoo ^{db} | 5 | 95 | 106 | 104 | | |
| DG 560TT | 1 | – | – | 101 | | |
| Hyola® 350TT | 1 | – | – | 113 | | |
| Hyola® 559TT | 3 | – | 107 | 103 | | |
| Hyola® 650TT | 5 | 106 | 113 | 107 | | |
| Pioneer® 44T02 TT | 2 | – | 102 | – | | |
| Pioneer® 45T01TT | 1 | – | 102 | – | | |
| CLEARFIELD® | | | | | | |
| Variety | Mean yield t/ha | | 2.07 | 2.64 | | |
| | No. trials | | 2 | 1 | | |
| Banker CL | 3 | Abandoned | 106 | 121 | Not sown | Abandoned |
| Hyola® 575CL | 3 | | 91 | 92 | | |
| Pioneer® 43Y92 (CL) | 1 | | – | 116 | | |
| Pioneer® 44Y90 (CL) | 3 | | 110 | 120 | | |
| Pioneer® 45Y91 (CL) | 1 | | – | 115 | | |
| Saintly CL | 3 | | 100 | 116 | | |
| Victory® V7002CL | 0 | | – | – | | |
| CONVENTIONAL | | | | | | |
| Variety | Mean yield t/ha | 1.87 | 91 | 92 | | |
| | No. trials | 2 | 2 | 1 | | |
| AV Garnet | 5 | 88 | 96 | 97 | Not sown | Abandoned |
| Nuseed Diamond | 5 | 104 | 91 | 102 | | |
| Nuseed Quartz | 1 | – | – | 113 | | |
| Victory® V3002 | 5 | 91 | 97 | 83 | | |

SOURCE: SARDI/GRDC, NVT 2014–2018 MET DATA ANALYSIS BY STATISTICS FOR THE AUSTRALIAN GRAINS INDUSTRY (SAGI)

NVT are not designed to allow comparison of varieties between herbicide-tolerance groups.
 Unseasonal conditions in 2017 resulted in no NVT canola trials being planted on LEP.

HyTTec® Trident

An early-maturity hybrid canola. Medium-tall plant height. Blackleg rating of R (resistance group ABDF). Tested in NVT 2017–19. Release for 2020 season. HyTTec® Trident is marketed with an EPR of \$10/tonne, but at a reduced seed price compared to other hybrid varieties. Bred and marketed by Nuseed.

HyTTec® Trophy

An early to mid-maturity hybrid canola. Medium-tall plant height. Blackleg rating of R-MR (resistance group ABD). Testing in NVT 2017–19. Released for 2018 season. HyTTec® Trophy is marketed with an EPR of \$10/tonne, but a reduced seed price compared to other hybrid varieties. Bred and marketed by Nuseed.

InVigor® T 3510

Early-maturing hybrid. Blackleg resistance rating of MS (resistance group BF). Tested in NVT 2018-19. Marketed by BASF.

InVigor® T 4510

Mid-season hybrid variety. Medium plant height. Suited to medium-rainfall areas. Blackleg resistance rating of MR-MS (resistance group BF). Tested in NVT in 2016–19. Marketed by BASF.

Monola® 314TT

Early-maturing specialty oil open-pollinated variety. Medium planted height. No current blackleg rating (resistance group different). Tested in NVT in 2013–15. Bred and marketed by Nuseed Pty Ltd. A premium payment will apply to Monola 314TT. Must be delivered to Glencore Grain at Tarlee and Coomandook.

TABLE 3 Mid North mid-season canola.

| TRIAZINE TOLERANT | | | | | | |
|---------------------------------|-----------------|------|------|------|------|------|
| Variety | Year | 2014 | 2015 | 2016 | 2017 | 2018 |
| | Mean yield t/ha | 2.35 | 1.76 | 2.80 | 2.34 | 1.34 |
| | No. trials | 3 | 3 | 3 | 3 | 1 |
| ATR Bonito [®] | 12 | 98 | 96 | 99 | 98 | 96 |
| ATR Mako [®] | 12 | 98 | 96 | 95 | 99 | 100 |
| ATR-Stingray [®] | 9 | 99 | 98 | 106 | 93 | 86 |
| ATR Wahoo [®] | 7 | 95 | 90 | 98 | 98 | – |
| DG 670TT | 6 | – | – | 114 | 109 | 105 |
| Hyola [®] 350TT | 3 | – | – | 113 | 108 | 112 |
| Hyola [®] 550TT | 1 | – | – | – | – | 114 |
| Hyola [®] 559TT | 13 | 106 | 110 | 104 | 108 | 115 |
| Hyola [®] 580CT | 2 | – | – | – | 103 | 103 |
| Hyola [®] 650TT | 11 | 103 | 103 | 103 | 108 | 109 |
| HyTTec Trident | 2 | – | – | – | 123 | 131 |
| HyTTec Trophy | 4 | – | – | – | 116 | 119 |
| InVigor [®] T 4510 | 7 | – | – | 118 | 112 | 113 |
| Monola [®] 314TT | 6 | 90 | 84 | – | – | – |
| Monola [®] 515TT | 10 | 88 | 80 | 85 | 86 | – |
| Pioneer [®] 44T02 TT | 7 | – | 114 | 108 | 107 | 113 |
| Pioneer [®] 45T03 TT | 1 | – | – | – | – | 97 |
| SF Ignite TT | 6 | – | – | 118 | 108 | 102 |
| SF Turbine TT | 10 | – | 114 | 115 | 106 | 107 |
| CLEARFIELD [®] | | | | | | |
| Variety | Mean yield t/ha | 2.35 | 1.76 | 2.8 | 2.34 | 1.34 |
| | No. trials | 3 | 3 | 3 | 3 | 1 |
| Banker CL | 12 | 107 | 111 | 118 | 104 | 101 |
| Hyola [®] 575CL | 13 | 95 | 93 | 94 | 93 | 90 |
| Pioneer [®] 43Y92 (CL) | 6 | – | – | 117 | 107 | 110 |
| Pioneer [®] 44Y90 (CL) | 10 | – | 114 | 117 | 108 | 109 |
| Pioneer [®] 45Y91 (CL) | 8 | 105 | – | 112 | 103 | – |
| Pioneer [®] 45Y93 (CL) | 3 | – | – | – | 109 | – |
| Saintly CL | 9 | – | 119 | 118 | 106 | – |
| Victory [®] V7002CL | 2 | – | – | – | 98 | – |
| CONVENTIONAL | | | | | | |
| Variety | Mean yield t/ha | 2.35 | 1.80 | 2.92 | 1.97 | |
| | No. trials | 1 | 1 | 1 | 1 | |
| AV Garnet | 4 | 82 | 82 | 87 | 79 | |
| Nuseed Diamond | 4 | 109 | 107 | 110 | 102 | |
| Nuseed Quartz | 2 | – | – | 115 | 115 | |
| Victory [®] V3002 | 3 | 91 | 88 | 82 | – | |

SOURCE: SARDI/GRDC, NVT 2014–2018 MET DATA ANALYSIS BY STATISTICS FOR THE AUSTRALIAN GRAINS INDUSTRY (SAGI)

NVT are not designed to allow comparison of varieties between herbicide-tolerance groups.

Monola® 515TT

A mid to late-maturing specialty oil open-pollinated variety. Blackleg rating of MR (resistance group different). Tested in NVT in 2014–17. Bred and marketed by Nuseed Pty Ltd. A premium payment will apply to Monola 515TT. Must be delivered to Glencore Grain at Tarlee and Coomandook.

Pioneer 44T02 (TT)

An early to mid-maturing hybrid variety. Medium plant height. Suited to low-medium rainfall areas. Blackleg resistance rating of R-MR (resistance group ABD). Tested in NVT in 2015–18. Marketed by Pioneer Brand Seeds.

Pioneer 45T03 (TT)

A mid-maturing triazine-tolerant hybrid. Medium plant height. Suited to medium-high rainfall areas. Blackleg resistance rating of R-MR (resistance group ABD). Tested in NVT 2018–19. Marketed by Pioneer Brand Seeds.

SF Ignite TT

Mid-maturing hybrid. Suited to medium to high-rainfall zones. Medium plant height Blackleg resistance rating MR (resistance group BF). Tested in NVT 2016–19. Marketed by Seed Force.

TABLE 4 Yorke Peninsula mid-season canola.

| TRIAZINE TOLERANT | | | | | | |
|---------------------------|-----------------|------|------|------|------|-----------|
| Variety | Year | 2014 | 2015 | 2016 | 2017 | 2018 |
| | Mean yield t/ha | 2.49 | 2.42 | 2.75 | 3.10 | Abandoned |
| | No. trials | 1 | 1 | 1 | 1 | |
| ATR Bonito [Ⓢ] | 3 | 97 | 98 | 97 | – | |
| ATR Mako [Ⓢ] | 4 | 100 | 99 | 96 | 100 | |
| ATR-Stingray [Ⓢ] | 4 | 89 | 96 | 96 | 94 | |
| DG 560TT | 3 | – | 103 | 105 | 101 | |
| DG 670TT | 2 | – | – | 111 | 109 | |
| Hyola® 350TT | 1 | – | – | – | 105 | |
| Hyola® 450TT | 2 | 104 | 102 | – | – | |
| Hyola® 559TT | 4 | 112 | 107 | 111 | 106 | |
| Hyola® 580CT | 1 | – | – | – | 103 | |
| Hyola® 650TT | 4 | 109 | 104 | 106 | 107 | |
| HyTTec Trophy | 1 | – | – | – | 113 | |
| InVigor T 4510 | 2 | – | – | 119 | 110 | |
| Monola® 515TT | 3 | 81 | 88 | 78 | – | |
| Pioneer® 44T02 TT | 3 | – | 107 | 113 | 104 | |
| SF Ignite TT | 2 | – | – | 112 | 108 | |
| SF Turbine TT | 3 | – | 106 | 114 | 104 | |
| CLEARFIELD® | | | | | | |
| Variety | Mean yield t/ha | 2.49 | 2.42 | 2.75 | 3.10 | Abandoned |
| | No. trials | 1 | 1 | 1 | 1 | |
| Banker CL | 4 | 103 | 105 | 112 | 103 | |
| Hyola® 575CL | 4 | 91 | 95 | 91 | 94 | |
| Pioneer® 43Y92 (CL) | 1 | – | – | 117 | – | |
| Pioneer® 44Y90 (CL) | 2 | – | 108 | – | 106 | |
| Pioneer® 45Y88 (CL) | 3 | 99 | 99 | 99 | – | |
| Pioneer® 45Y91 (CL) | 3 | 102 | – | 108 | 102 | |
| Pioneer® 45Y93 (CL) | 1 | – | – | – | 108 | |
| Saintly CL | 3 | – | 108 | 117 | 103 | |
| Victory® V7002CL | 1 | – | – | – | 99 | |
| CONVENTIONAL | | | | | | |
| Variety | Mean yield t/ha | 2.49 | 2.42 | 2.75 | 3.10 | Abandoned |
| | No. trials | 1 | 1 | 1 | 1 | |
| AV Garnet | 4 | 84 | 91 | 83 | 94 | |
| Nuseed Diamond | 4 | 102 | 103 | 108 | 98 | |
| Nuseed Quartz | 2 | – | – | 116 | 107 | |
| Victory® V3002 | 3 | 94 | 93 | 85 | – | |

SOURCE: SARDI/GRDC, NVT 2014–2018 MET DATA ANALYSIS BY STATISTICS FOR THE AUSTRALIAN GRAINS INDUSTRY (SAGI)

NVT are not designed to allow comparison of varieties between herbicide-tolerance groups.

TABLE 5 South East mid-season canola.

| TRIAZINE TOLERANT | | | | | | |
|---------------------------------|-----------------|------|------|------|------|------|
| Variety | Year | 2014 | 2015 | 2016 | 2017 | 2018 |
| | Mean yield t/ha | 1.23 | 0.98 | 2.70 | 3.23 | 2.56 |
| | No. trials | 3 | 3 | 1 | 2 | 1 |
| ATR Bonito [®] | 9 | 96 | 95 | 98 | 100 | 98 |
| ATR Mako [®] | 9 | 96 | 97 | 95 | 100 | 100 |
| ATR Wahoo [®] | 9 | 85 | 85 | 96 | 103 | 97 |
| DG 670TT | 4 | – | – | 112 | 111 | 104 |
| Hyola [®] 350TT | 3 | – | – | 114 | 104 | 106 |
| Hyola [®] 550TT | 1 | – | – | – | – | 107 |
| Hyola [®] 559TT | 10 | 111 | 116 | 104 | 105 | 107 |
| Hyola [®] 580CT | 2 | – | – | – | 103 | 102 |
| Hyola [®] 650TT | 9 | 101 | 105 | 102 | 108 | 106 |
| HyTtec [®] Trident | 1 | – | – | – | – | 116 |
| HyTtec [®] Trophy | 3 | – | – | – | 113 | 110 |
| InVigor [®] T 3510 | 1 | – | – | – | – | 103 |
| InVigor [®] T 4510 | 4 | – | – | 118 | 110 | 108 |
| Monola [®] 515TT | 8 | 79 | 73 | 85 | 91 | – |
| Pioneer [®] 44T02 TT | 6 | – | 119 | 109 | 102 | 106 |
| Pioneer [®] 45T03 TT | 1 | – | – | – | – | 99 |
| SF Ignite TT | 4 | – | – | 117 | 110 | 102 |
| SF Turbine TT | 4 | – | 115 | 115 | 104 | 104 |
| CLEARFIELD [®] | | | | | | |
| Variety | Mean yield t/ha | 1.23 | 0.97 | 2.70 | 3.21 | 2.56 |
| | No. trials | 3 | 3 | 1 | 2 | 1 |
| Banker CL | 8 | 110 | 108 | 117 | 104 | 101 |
| Hyola [®] 575CL | 10 | 93 | 90 | 94 | 94 | 95 |
| Pioneer [®] 43Y92 (CL) | 3 | – | – | 118 | 102 | 105 |
| Pioneer [®] 44Y90 (CL) | 7 | – | 115 | 116 | 107 | 105 |
| Pioneer [®] 45Y91 (CL) | 4 | 108 | – | – | 103 | 101 |
| Pioneer [®] 45Y93 (CL) | 2 | – | – | – | 109 | – |
| Saintly CL | 7 | – | 122 | 119 | 101 | 104 |
| Victory [®] V7002CL | 3 | – | – | – | 100 | 99 |
| CONVENTIONAL | | | | | | |
| Variety | Mean yield t/ha | 1.23 | 0.97 | 2.70 | 3.21 | 2.56 |
| | No. trials | 3 | 3 | 1 | 2 | 1 |
| AV Garnet | 10 | 79 | 74 | 92 | 96 | 90 |
| Nuseed Diamond | 10 | 116 | 114 | 109 | 95 | 101 |
| Nuseed Quartz | 4 | – | – | 112 | 107 | 107 |
| Victory [®] V3002 | 8 | 82 | 83 | 83 | – | 97 |

SOURCE: SARDI/GRDC, NVT 2014–2018 MET DATA ANALYSIS BY STATISTICS FOR THE AUSTRALIAN GRAINS INDUSTRY (SAGI)

NVT are not designed to allow comparison of varieties between herbicide-tolerance groups.

TABLE 6 Upper Eyre Peninsula early-season canola.

| TRIAZINE TOLERANT | | | | | | |
|----------------------------|-----------------|------|------|------|----------|------|
| Variety | Year | 2014 | 2015 | 2016 | 2017 | 2018 |
| | Mean yield t/ha | 1.31 | 1.55 | 1.36 | | 1.16 |
| | No. trials | 2 | 2 | 2 | | 2 |
| ATR Bonito ^{db} | 8 | 101 | 100 | 98 | Not sown | 97 |
| ATR-Stingray ^{db} | 8 | 113 | 103 | 99 | | 87 |
| Hyola® 350TT | 2 | — | — | — | | 114 |
| Hyola® 559TT | 8 | 112 | 108 | 105 | | 111 |
| HyTTec® Trident | 2 | — | — | — | | 123 |
| HyTTec® Trophy | 2 | — | — | — | | 109 |
| InVigor® T 3510 | 2 | — | — | — | | 107 |
| InVigor® T 4510 | 4 | — | — | 107 | | 117 |
| Pioneer® 44T02 TT | 6 | — | 106 | 107 | | 112 |
| CLEARFIELD® | | | | | | |
| Variety | Mean yield t/ha | 1.31 | 1.55 | 1.35 | | 1.16 |
| | No. trials | 2 | 2 | 2 | | 2 |
| Banker CL | 4 | — | 91 | 115 | Not sown | — |
| Hyola® 575CL | 8 | 107 | 102 | 95 | | 95 |
| Pioneer® 43Y92 (CL) | 4 | — | — | 109 | | 112 |
| Pioneer® 44Y90 (CL) | 6 | — | 109 | 111 | | 111 |
| Saintly CL | 2 | — | 107 | — | | — |
| Victory® V7002CL | 2 | — | — | — | | 105 |
| CONVENTIONAL | | | | | | |
| Variety | Mean yield t/ha | 0.89 | 1.49 | 1.68 | | 1.37 |
| | No. trials | 1 | 1 | 1 | | 1 |
| AV Garnet | 4 | 86 | 88 | 95 | Not sown | 82 |
| Nuseed Diamond | 4 | 147 | 120 | 105 | | 109 |
| Nuseed Quartz | 2 | — | — | 110 | | 112 |
| Victory® V3002 | 3 | — | 103 | 88 | | 91 |

SOURCE: SARDI/GRDC, NVT 2014–2018 MET DATA ANALYSIS BY STATISTICS FOR THE AUSTRALIAN GRAINS INDUSTRY (SAGI)

NVT are not designed to allow comparison of varieties between herbicide-tolerance groups.
 Unseasonal conditions in 2017 resulted in no NVT canola trials being planted on UEP.

TABLE 7 Yorke Peninsula early-season canola.

| TRIAZINE TOLERANT | | | | | | |
|----------------------------|-----------------|------|------|------|------|------|
| Variety | Year | 2014 | 2015 | 2016 | 2017 | 2018 |
| | Mean yield t/ha | 2.15 | 1.68 | 2.69 | 2.75 | 1.34 |
| | No. trials | 1 | 1 | 1 | 1 | 1 |
| ATR Bonito ^{db} | 5 | 99 | 98 | 97 | 99 | 97 |
| ATR Mako ^{db} | 2 | 99 | 101 | – | – | – |
| ATR-Stingray ^{db} | 5 | 96 | 100 | 89 | 100 | 78 |
| DG 670TT | 1 | – | – | – | – | 103 |
| Hyola® 350TT | 2 | – | – | – | 106 | 111 |
| Hyola® 559TT | 4 | 111 | 113 | 107 | – | 117 |
| HyITec® Trident | 1 | – | – | – | – | 118 |
| HyITec® Trophy | 2 | – | – | – | 110 | 106 |
| InVigor® T 3510 | 1 | – | – | – | – | 114 |
| InVigor® T 4510 | 3 | – | – | 113 | 106 | 124 |
| Monola® 515TT | 2 | 81 | 76 | – | – | – |
| Pioneer® 44T02 TT | 4 | – | 113 | 109 | 106 | 114 |
| Pioneer® 45T03 TT | 1 | – | – | – | – | 90 |
| SF Turbine TT | 4 | – | 105 | 109 | 101 | 124 |
| CLEARFIELD® | | | | | | |
| Variety | Mean yield t/ha | 2.15 | 1.68 | 2.69 | 2.75 | 1.34 |
| | No. trials | 1 | 1 | 1 | 1 | 1 |
| Banker CL | 3 | – | 104 | 107 | 107 | – |
| Hyola® 575CL | 5 | 101 | 97 | 94 | 97 | 99 |
| Pioneer® 43Y92 (CL) | 3 | – | – | 109 | 107 | 111 |
| Pioneer® 44Y90 (CL) | 4 | – | 118 | 108 | 109 | 108 |
| Saintly CL | 2 | – | 116 | – | 108 | – |
| Victory® V7002CL | 2 | – | – | – | 102 | 123 |

SOURCE: SARDI/GRDC, NVT 2014–2018 MET DATA ANALYSIS BY STATISTICS FOR THE AUSTRALIAN GRAINS INDUSTRY (SAGI)

NVT are not designed to allow comparison of varieties between herbicide-tolerance groups.

TABLE 8 Mallee early-season canola.

| TRIAZINE TOLERANT | | | | | | |
|----------------------------|-----------------|------|------|------|------|--|
| Variety | Year | 2015 | 2016 | 2017 | 2018 | |
| | Mean yield t/ha | 0.48 | 1.44 | 1.31 | 0.52 | |
| | No. trials | 1 | 1 | 1 | 1 | |
| HyITec® Trident | 1 | – | – | – | 177 | |
| HyITec® Trophy | 2 | – | – | 113 | 147 | |
| Hyola® 350TT | 2 | – | – | 108 | 100 | |
| Pioneer® 44T02 TT | 4 | 119 | 107 | 107 | 114 | |
| InVigor® T 4510 | 3 | – | 108 | 106 | 106 | |
| Hyola® 559TT | 3 | 119 | 101 | – | 118 | |
| InVigor® T 3510 | 1 | – | – | – | 125 | |
| ATR-Stingray ^{db} | 3 | 107 | 96 | – | 124 | |
| SF Turbine TT | 2 | – | – | 100 | 94 | |
| ATR Bonito ^{db} | 4 | 98 | 97 | 99 | 101 | |
| Monola® 515TT | 1 | 62 | – | – | – | |
| CLEARFIELD® | | | | | | |
| Variety | Mean yield t/ha | 0.48 | 1.44 | 1.31 | 0.52 | |
| | No. trials | 1 | 1 | 1 | 1 | |
| Banker CL | 3 | 107 | 139 | 112 | – | |
| Pioneer® 44Y90 (CL) | 4 | 131 | 112 | 112 | 130 | |
| Saintly CL | 3 | 127 | – | 111 | 124 | |
| Pioneer® 43Y92 (CL) | 3 | – | 110 | 109 | 121 | |
| Victory® V7002CL | 1 | – | – | – | 141 | |
| Hyola® 575CL | 4 | 97 | 89 | 97 | 106 | |

SOURCE: SARDI/GRDC, NVT 2014–2018 MET DATA ANALYSIS BY STATISTICS FOR THE AUSTRALIAN GRAINS INDUSTRY (SAGI)

NVT are not designed to allow comparison of varieties between herbicide-tolerance groups.

NVT canola trials were not conducted in the SA Mallee Region prior to 2015

TABLE 9 South East early-season canola.

| TRIAZINE TOLERANT | | | | | | |
|----------------------------|-----------------|------|------|------|------|------|
| Variety | Year | 2014 | 2015 | 2016 | 2017 | 2018 |
| | Mean yield t/ha | 0.36 | 0.66 | 2.38 | 1.73 | 1.50 |
| | No. trials | 1 | 1 | 1 | 1 | 1 |
| ATR Bonito ^{db} | 5 | 106 | 91 | 99 | 99 | 98 |
| ATR Mako ^{db} | 2 | 85 | 102 | – | – | – |
| ATR-Stingray ^{db} | 5 | 143 | 63 | 102 | 102 | 96 |
| DG 670TT | 1 | – | – | – | – | 104 |
| Hyola® 350TT | 2 | – | – | – | 107 | 111 |
| Hyola® 559TT | 4 | 131 | 141 | 106 | – | 112 |
| HyTtec® Trident | 1 | – | – | – | – | 136 |
| HyTtec® Trophy | 2 | – | – | – | 112 | 117 |
| InVigor® T 3510 | 1 | – | – | – | – | 111 |
| InVigor® T 4510 | 3 | – | – | 107 | 105 | 114 |
| Monola® 515TT | 2 | 48 | 27 | – | – | – |
| Pioneer® 44T02 TT | 4 | – | 142 | 108 | 106 | 112 |
| Pioneer® 45T03 TT | 1 | – | – | – | – | 105 |
| SF Turbine TT | 4 | – | 142 | 99 | 100 | 107 |
| CLEARFIELD® | | | | | | |
| Variety | Mean yield t/ha | 0.36 | 0.66 | 2.38 | 1.73 | 1.50 |
| | No. trials | 1 | 1 | 1 | 1 | 1 |
| Banker CL | 3 | – | 92 | 116 | 111 | – |
| Hyola® 575CL | 5 | 130 | 87 | 96 | 97 | 97 |
| Pioneer® 43Y92 (CL) | 3 | – | – | 111 | 108 | 114 |
| Pioneer® 44Y90 (CL) | 4 | – | 140 | 114 | 111 | 116 |
| Saintly CL | 2 | – | 133 | – | 110 | – |
| Victory® V7002CL | 2 | – | – | – | 101 | 111 |
| CONVENTIONAL | | | | | | |
| Variety | Mean yield t/ha | 0.36 | 0.66 | 2.38 | 1.73 | 1.50 |
| | No. trials | 1 | 1 | 1 | 1 | 1 |
| AV Garnet | 5 | 73 | 36 | 93 | 94 | 83 |
| Nuseed Diamond | 5 | 215 | 152 | 109 | 108 | 120 |
| Nuseed Quartz | 3 | – | – | 113 | 110 | 115 |
| Victory® V3002 | 3 | – | 80 | 87 | – | 92 |

SOURCE: SARDI/GRDC, NVT 2014–2018 MET DATA ANALYSIS BY STATISTICS FOR THE AUSTRALIAN GRAINS INDUSTRY (SAGI)

NVT are not designed to allow comparison of varieties between herbicide-tolerance groups.

FABA BEAN

By Amanda Pearce, Rohan Kimber and Sara Blake, SARDI, and Jeff Paull, University of Adelaide

Two faba bean varieties were released in the spring of 2018, PBA Bendoc[®] and PBA Marne[®], and an additional variety, PBA Amberley[®], is to be available in 2020.

PBA Amberley[®] is a later flowering variety that has yielded well in districts with a longer growing season. It has a very good overall level of disease resistance and is resistant (MR-R) to both pathotypes of Ascochyta blight and has a higher level of resistance (MR) to Chocolate spot than all other varieties. Plants have very good standing ability with a low incidence of 'necking'. Seed is medium in size and suitable for co-mingling with other medium-sized varieties. Seed is available from the commercial partner Seednet.

PBA Bendoc[®] is the first faba bean variety with a high level of tolerance to some Group B herbicides. The Group B herbicide tolerance will not only increase the options for control of broad leaf weeds within crop, but also enable the variety to be grown where residues persist from application to a previous crop. Note that permits, product label rates, plant-back periods and all label directions for use must be adhered to.

PBA Bendoc[®] has similar yield compared to the other major faba bean varieties grown in southern Australia and is resistant (MR-R) to both pathotypes of Ascochyta blight. Seed is small-medium in size and suited to the Middle East markets. Seed is available from the commercial partner Seednet.

PBA Marne[®] is an early-flowering, high-yielding faba bean that has shown adaptation to the lower rainfall and short season areas in southern Australia where yield is generally greater than current cultivars. PBA Marne[®] offers potential to expand faba bean production into areas currently considered marginal and to improve reliability in established areas during below-average rainfall seasons. Seed is light brown and medium in size and suitable for co-mingling with the current faba bean varieties for export to the major food markets in the Middle East. Seed is

available from the commercial partner Seednet.

Faba beans are cross-pollinated by bees. Seed crops should be isolated from other varieties by at least 200m to minimise the risk of cross-pollination and maintain genetic purity of the variety. This is particularly important for specific traits such as disease resistance and seed quality.

VARIETIES AND MARKET PREFERENCES

Australian faba beans are preferred by the Middle East human consumption market, although competition for market share from France, the United Kingdom and, more recently, the Baltic states occurs. To access the export human food markets, Australian beans must be of a high quality and free from mechanical damage, weathering and disease staining and storage problems. Faba beans darken over time while in storage and seed can become unsuitable for the export market after about nine months.

Farah[®], Nura[®] and Fiesta VF varieties are well accepted in the Middle East. Seed of PBA Samira[®], PBA Bendoc[®], PBA Marne[®] and PBA Amberley[®] are of similar size and acceptance is expected by the same markets.

Market signals indicate that small-seeded faba bean varieties, such as the old Fiord and Ascot varieties, are no longer desired in the Middle East. Mixing smaller seeded varieties into the accepted larger 'Fiesta grade' will downgrade the overall quality of the product.

The medium seed size 'Fiesta grade' is expected to remain the dominant quality type as it is currently well accepted in the Middle East market and is easier to manage for on-farm operations.

PBA Rana[®] seed is larger than other varieties and considered to be of high quality by the major Egyptian market, representing a different grain category for faba bean production and marketing

in Australia. PBA Zahra[®] should be suitable to co-mingle with PBA Rana[®] for a medium-large bean category for export market to the major food markets in the Middle East.

Product that does not meet export standards or is surplus to demand is consumed domestically in stockfeed rations, often at lower prices. Sound beans are also finding a place in many integrated cropping and grazing enterprises as a means of finishing lambs on farm. Strong demand by graziers for feed beans can occur in dry conditions.

VARIETIES AND DISEASE MANAGEMENT

In growing regions or seasonal conditions that favour Chocolate spot development, all varieties require a protective fungicide spray before canopy closure, and often when the crop is at the early flowering stage. Additional applications will be required if wet conditions favour epidemics, particularly when early disease symptoms are evident, soil moisture is high and dense canopy growth retains moisture levels within the canopy. Chocolate spot typically develops during early spring as temperatures increase; however, it can establish in crops earlier, so faba beans should be monitored from later winter. PBA Amberley[®] is moderately resistant to Chocolate spot and will require less fungicide applications to control the disease compared to all other varieties.

A shift in virulence for *Ascochyta* blight has seen the disease rating for *Ascochyta* blight separated into two pathotypes. The older form, pathotype 1, is widely distributed in the southern region, whilst the newer form, pathotype 2, was initially identified in the mid-north of SA but is now widespread throughout south eastern Australia. Resistant varieties allow growers to be more reactive to *Ascochyta* blight than with susceptible varieties, and disease management strategies can be based on monitoring levels in high-risk situations.

PBA Amberley[®], Nura[®], PBA Bendoc[®] and PBA Samira[®] are resistant (MR-R) to both pathotypes. The old varieties, Farah[®] and Fiesta VF are susceptible to AB while PBA Marne[®], PBA Rana[®] and PBA Zahra[®] are MR-MS to this disease. Prophylactic fungicides are recommended in S, MS and MR-MS varieties during early and vegetative growth to prevent or minimise disease establishment. Additional fungicides will most likely be required, especially in seasons favourable to disease epidemics, particularly during podding to prevent seed staining.

Rust can be an occasional problem in faba beans in seasons favouring disease outbreaks and can cause significant yield loss. The disease can survive over summer on volunteer bean plants, and crops need to be monitored to reduce the impact of rust on production. Farah[®], Fiesta VF and PBA Bendoc[®] are susceptible to rust, often displaying more pronounced symptoms than Nura[®], PBA Rana[®], PBA Samira[®] and PBA Zahra[®] which are moderately susceptible. PBA Marne[®] is MR to rust. Early sown crops are at greater risk, or where beans are sown adjacent to the previous year's bean stubble. Disease control using suitable fungicides may be required before flowering, coinciding with the time Chocolate spot management is also being implemented.

Cercospora leaf spot continues to be widely reported in faba beans. The disease is soil borne and typically occurs in paddocks with a history of faba beans in the rotation, particularly where they have been grown in close rotation (less than four to six years) or within close proximity of these paddocks. Early control (five to eight weeks post sowing) with carbendazim or tebuconazole is most effective in preventing disease establishment and consequent yield loss from *Cercospora* leaf spot. All current faba bean varieties are susceptible, thus early preventative control measures are best practice.

The *Australian Pulse Bulletin – Faba Bean Integrated Disease Management*, published by Pulse Australia, contains the latest information on disease management in faba beans, and can be found at: <http://www.pulseaus.com.au/growing-pulses/bmp/faba-and-broad-bean/idm-strategies>.

HARVEST

In high biomass production situations, lodging can become an issue. Conversely, crops with short canopies can cause problems with low harvest height, particularly in varieties that produce bottom pods close to the ground.

Physical damage of bean seed has resulted in marketing downgrades in recent years, and needs to be managed. Bud worm needs early monitoring and control, even in seasons with below-average rainfall. Growers should harvest beans when they have a high moisture content (12 to 14 per cent) to avoid breakage and handle the beans carefully when shifting them.

Crop-topping of faba beans can make them more vulnerable to seed staining, particularly if rain falls soon after application. Crop-topping too early or using products or rates that cause crops to dry down quickly can exacerbate the issue. Maturity of current faba bean varieties are not as well suited to crop-topping as the industry would like, particularly in better seasons, hence all grain may not be mature when the ryegrass is ready to top.

NOTES ON FABA BEAN VARIETIES

PBA Amberley[®]

PBA Amberley[®] is a faba bean breeding line that is to be released for commercial production in 2020. It is a later flowering type and has shown good adaptation in higher rainfall and longer growing season environments in the south-east and mid-north of SA and in the western districts of Victoria. PBA Amberley[®] has an improved level of disease resistance compared to all other faba bean varieties. It is MR-R to both Ascochyta blight pathotypes 1 and 2, but the major improvement in disease resistance compared to other varieties is in its response to Chocolate spot, where it is rated MR. The improvement in disease resistance should assist in reliability of production in high-yielding situations where foliar diseases are a significant risk. Seed of PBA Amberley[®] is similar in size to PBA Samira[®] and PBA Marne[®] and should be suitable to co-mingle with these other varieties. Plants of PBA Amberley[®] have very good standing ability and a low incidence of 'necking'. PBA Amberley[®] is commercialised by Seednet and an end point royalty applies.

PBA Bendoc[®]

PBA Bendoc[®] was developed by the University of Adelaide, in collaboration with SARDI. Tolerance to imidazolinone herbicides was developed by conventional mutation breeding techniques in Nura[®]. A herbicide-tolerant selection was crossed with PBA Samira[®] and PBA Bendoc[®] was derived from the progeny of this cross. It has been selected for tolerance to imidazolinone herbicides applied post-emergence when plants are at up to the five-node growth stage. Note that permits, product label rates, plant-back periods and all label directions for use must be adhered to. Generally, PBA Bendoc[®] yields comparably to conventional varieties with no obvious yield penalty associated with herbicide tolerance. PBA Bendoc[®] is similar in flowering time and maturity, and has a similar resistance (MR/R) to both pathotypes of Ascochyta blight as Nura[®] and PBA Samira[®]. It is rated S to Chocolate spot and this will need to be managed in higher rainfall and high biomass situations. PBA Bendoc[®] produces

small-medium sized, light brown seeds that are comparable in size to Nura[®]. PBA Bendoc[®] seed can be co-mingled with these other varieties for the Middle East market. PBA Bendoc[®] is licensed to Seednet and an end point royalty applies.

PBA Marne[®]

PBA Marne[®] (evaluated as AF09169) was developed by the PBA Faba bean breeding program led by University of Adelaide. It is the result of a complex cross between four parents of diverse origins. PBA Marne[®] is an early-flowering faba bean variety that is well suited to lower rainfall or short-season environments of southern Australia. It is the earliest flowering variety, with maturity similar to PBA Samira[®]. It is medium-short in height. The overall disease-resistance profile of PBA Marne[®] is improved compared to Fiesta VF and Farah[®], being rated MR-R to Ascochyta blight pathotype 1, MS-MR to pathotype 2 and MR to rust. It is rated S to Chocolate spot and Cercospora leaf spot. PBA Marne[®] produces medium-sized seeds that are comparable in size to PBA Samira[®]. The overall colour of seed is similar to other major bean varieties. PBA Marne[®] seed can be co-mingled with these other varieties for the Middle East market. PBA Marne[®] is licensed to Seednet and an end point royalty applies.

PBA Zahra[®]

PBA Zahra[®] (evaluated as AF05095 and the re-selection AF05095-1) is the result of a cross between Farah[®] and an accession 920/3, which originated from Morocco. It has shown wide adaptation throughout southern Australia and is very responsive to high-yielding situations. PBA Zahra[®] seed is uniform large size and colour and should be suitable to co-mingle with PBA Rana[®] for a medium-large faba bean category for the Egyptian market. PBA Zahra[®] is mid flowering, similar to Nura[®], PBA Rana[®] and PBA Samira[®] and mid maturity similar to PBA Rana[®]. It is a medium-tall plant similar to PBA Rana[®] and taller than other varieties. It is rated MR-R to pathotype 1 of Ascochyta blight and MS-MR to pathotype 2. PBA Zahra[®] is rated as MS to Chocolate spot and rust, and S to Cercospora leaf spot. PBA Zahra[®] is licensed to Seednet and an end point royalty applies.

PBA Samira[®]

PBA Samira[®] (tested as AF05069 and the re-selection AF05069-2) is a high-yielding faba bean variety for southern Australia. It is widely adapted and is responsive to high-yielding situations. It has mid flowering, five to 10 days later than Fiesta VF and Farah[®], but matures at the same time as these

varieties. PBA Samira[®] is rated MR-R to Ascochyta blight pathotype 1 and pathotype 2. It is rated MS to Chocolate spot and rust, and S to Cercospora leaf spot. Seed of PBA Samira[®] is slightly larger than Fiesta VF, Farah[®] and Nura[®], but the overall seed colour is similar for all varieties. PBA Samira[®] can be co-mingled with these other varieties for the Middle East market. PBA Samira[®] is licensed to Seednet and an end point royalty applies.

PBA Rana[®]

PBA Rana[®] (tested as AF01006-1 or 974*(611*974)/15-1) has good vigour and stem strength. It has mid flowering (similar to Nura[®]) and mid maturity (later than Nura[®] and Farah[®]). PBA Rana[®] is well adapted to high-rainfall areas with longer growing seasons. PBA Rana[®] is MR-R to Ascochyta blight pathotype 1 and is rated MS-MR to pathotype 2. It is rated MS to Chocolate spot and rust, and S to Cercospora leaf spot. PBA Rana[®] produces large, plump, light brown seeds and is suited to meeting Egyptian market requirements for that grade. PBA Rana[®] represents a unique category for faba bean marketing. As PBA Rana[®] is three-quarters Manafest in its breeding, it should establish itself into areas where Manafest was grown before Ascochyta blight saw its demise. PBA Rana[®] is licensed to Seednet and an end point royalty applies.

Nura[®]

Nura[®] is a medium-sized faba bean rated MR/R to both pathotypes of Ascochyta blight. Nura[®] is rated MS to Chocolate spot, S to Cercospora leaf spot and MS to rust. It is generally shorter than Fiesta VF and Farah[®] meaning it is less likely to lodge. However, since its bottom pods are closer to the ground, harvest can be more difficult in lower rainfall districts or when sown late. In most areas long-term yields of Nura[®] tend to be slightly lower than Farah[®] and more recent varieties. It has good seed appearance, light buff in colour, with minimal seed staining and discolouration. Flowering time of Nura[®] is generally around seven days later than Farah[®], although it has similar maturity. Nura[®] is licensed to Seednet and an end point royalty applies.

Farah[®]

Farah[®] was selected directly from Fiesta VF and is identical in many respects, except it is rated MR-R to Ascochyta blight pathotype 1 and tends to have more uniform seed size and colour. Farah[®] is rated S to pathotype 2 of Ascochyta blight. Farah[®]'s yields are similar to Fiesta VF but generally lower than more recent varieties in most regions of southern Australia. The major advantage of Farah[®] over Fiesta VF is the increased likelihood of

achieving market standards for freedom from seed staining. Farah[®] is licensed to Heritage Seeds and an end point royalty applies.

Fiesta VF

Fiesta VF seed is buff coloured and larger than Fiord. Fiesta VF has good seedling vigour, is of medium height and is early to mid flowering. It is classed as S to Chocolate spot, although it is less susceptible than Fiord. Fiesta VF is rated S to both pathotypes of Ascochyta blight, so a proactive disease management strategy is recommended to achieve clean seed and ensure market standards are met. Fiesta VF is no longer protected by PBR, and no end point royalty applies.

BROAD BEAN VARIETIES

PBA Kareema

PBA Kareema was selected from Aquadulce and has similar plant type and adaptation to this variety, but larger and more uniform seed and no 'evergreens'. It is well adapted to the very high rainfall broad bean districts in the lower south-east of SA. It has significantly improved resistance to Ascochyta blight (MR) and better rust resistance (MR) than Aquadulce, and is MS to Chocolate spot. Like Aquadulce, PBA Kareema is more tolerant of waterlogging than most varieties of faba bean, and is more tolerant of iron and manganese deficiencies. PBA Kareema is licensed to PGG Wrightson and an end point royalty applies.

Aquadulce

Aquadulce is a tall broad bean variety, with late flowering and maturity, suited to areas with at least 500mm average annual rainfall, such as the lower south-east of SA. It is rated MS for Chocolate spot, but can succumb under high disease pressure and rainfall situations. Aquadulce is more tolerant of waterlogging than most faba bean varieties and tolerates soils with iron and manganese deficiencies. The large seed size of Aquadulce means it must be considered a specialty bean as it has different marketing opportunities to faba beans. It commands a price premium over faba beans, dependent on grading and seed size.

FURTHER INFORMATION

Variety Management Packages (VMP) for all named varieties (except Aquadulce) are available on the Pulse Australia website: <http://www.pulseaus.com.au/growing-pulses/bmp/faba-and-broad-bean>.

TABLE 1 Most adapted faba bean varieties for each rainfall zone.

| Rainfall zone (average annual rainfall) | | |
|---|----------------------------|----------------------------|
| Low <375mm | Medium 375–500mm | High >500mm |
| PBA Marne ^{db} | PBA Zahra ^{db} | PBA Zahra ^{db} |
| PBA Bendoc ^{db} | PBA Amberley ^{db} | PBA Amberley ^{db} |
| Farah ^{db} | PBA Samira ^{db} | PBA Samira ^{db} |
| Fiesta VF | PBA Marne ^{db} | PBA Rana ^{db} |
| Nura ^{db} | PBA Bendoc ^{db} | Nura ^{db} |
| PBA Samira ^{db} | Nura ^{db} | PBA Bendoc ^{db} |
| PBA Zahra ^{db} | Farah ^{db} | PBA Marne ^{db} |
| | Fiesta VF | Fiesta VF |

TABLE 2 Agronomic and disease characteristics of faba and broad bean varieties.

| Variety | Plant height | Flower time | Maturity | Lodging resistance | Ascochyta blight* | | Chocolate spot | Cercospora leaf spot | Rust | PSbMV seed staining |
|----------------------------|--------------|-------------|-----------|--------------------|-------------------|-------------|----------------|----------------------|------|---------------------|
| | | | | | Pathotype 1 | Pathotype 2 | | | | |
| FABA BEAN | | | | | | | | | | |
| Farah ^{db} | Medium | Early-Mid | Early-Mid | MS | MR-R | S | S | S | S | S |
| Fiesta VF | Medium | Early-Mid | Early-Mid | MS | S | S | S | S | S | S |
| Nura ^{db} | Short | Mid | Early-Mid | MR | MR-R | MR-R | MS | S | MS | VS |
| PBA Amberley ^{db} | Medium | Mid | Mid | MR | MR-R | MR-R | MR | S | S | – |
| PBA Bendoc ^{db} | Medium | Mid | Early-Mid | MS | MR-R | MR-R | S | S | S | S |
| PBA Marne ^{db} | Medium-Short | Early | Early-Mid | MR | MR-R | MS-MR | S | S | MR | MR |
| PBA Rana ^{db} | Medium-Tall | Mid | Mid | MR | MR-R | MS-MR | MS | S | MS | MR |
| PBA Samira ^{db} | Medium | Mid | Early-Mid | MR | MR-R | MR-R | MS | S | MS | S |
| PBA Zahra ^{db} | Medium-Tall | Mid | Mid | MR | MR-R | MS-MR | MS | S | MS | S |
| BROAD BEAN | | | | | | | | | | |
| Aquadulce | Tall | Mid | Late | MS | MS | MS | MS | S | MS | S |
| PBA Kareema | Tall | Mid | Late | MS | MR | MR | MS | S | MR | S |

SOURCE: PULSE BREEDING AUSTRALIA TRIALS PROGRAM 2012–2017

Key: R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible, VS = very susceptible

* Ascochyta blight ratings: Pathotype 1 is widely distributed throughout the southern region, and pathotype 2, which was identified in the mid-north of South Australia in 2013, is now widespread throughout the south-east of southern Australia

TABLE 3 Mid North faba bean yield performance. NVT data 2014–18.

Long-term yield expressed as a percentage of mean yield.

| Variety | Year | 2014 | 2015 | 2016 | 2017 | 2018 |
|----------------------------|-----------------|------|------|------|------|------|
| | Mean yield t/ha | 2.57 | 2.02 | 5.09 | 3.2 | 1.69 |
| | No. trials | 5 | 5 | 3 | 2 | 4 |
| PBA Amberley ^{db} | 17 | 91 | 97 | 105 | 105 | 108 |
| PBA Zahra ^{db} | 19 | 105 | 101 | 102 | 107 | 102 |
| PBA Samira ^{db} | 19 | 100 | 99 | 102 | 106 | 102 |
| PBA Rana ^{db} | 19 | 83 | 83 | 94 | 92 | 95 |
| PBA Marne ^{db} | 19 | 101 | 104 | 103 | 93 | 99 |
| PBA Bendoc ^{db} | 9 | – | – | 94 | 101 | 104 |
| Nura ^{db} | 19 | 98 | 94 | 92 | 85 | 97 |
| Fiesta VF | 19 | 96 | 98 | 94 | 102 | 100 |
| Farah ^{db} | 19 | 99 | 98 | 94 | 99 | 98 |

TABLE 4 Yorke Peninsula faba bean yield performance. NVT data 2014–18.

Long-term yield expressed as a percentage of mean yield.

| Variety | Year | 2014 | 2015 | 2016 | 2017 | 2018 |
|----------------------------|-----------------|------|------|------|------|------|
| | Mean yield t/ha | 3.03 | 2.39 | 4.54 | 3.87 | 3.05 |
| | No. trials | 2 | 2 | 2 | 2 | 2 |
| PBA Amberley ^{db} | 8 | – | 92 | 96 | 103 | 104 |
| PBA Zahra ^{db} | 10 | 101 | 100 | 101 | 106 | 103 |
| PBA Samira ^{db} | 10 | 96 | 98 | 99 | 103 | 102 |
| PBA Rana ^{db} | 10 | 81 | 85 | 90 | 95 | 96 |
| PBA Marne ^{db} | 10 | 107 | 106 | 103 | 96 | 97 |
| PBA Bendoc ^{db} | 6 | – | – | 105 | 103 | 102 |
| Nura ^{db} | 10 | 99 | 97 | 101 | 100 | 96 |
| Fiesta VF | 10 | 94 | 95 | 96 | 99 | 100 |
| Farah ^{db} | 10 | 98 | 98 | 99 | 100 | 99 |

TABLE 5 Lower Eyre Peninsula faba bean yield performance. NVT data 2015–18.

Long-term yield expressed as a percentage of mean yield.
Data for 2017 not available due to poor seasonal conditions.

| Variety | Year | 2015 | 2016 | 2018 |
|----------------------------|-----------------|------|------|------|
| | Mean yield t/ha | 1.82 | 4.57 | 3.68 |
| | No. trials | 1 | 1 | 1 |
| PBA Amberley ^{db} | 3 | 83 | 100 | 97 |
| PBA Zahra ^{db} | 3 | 100 | 102 | 102 |
| PBA Samira ^{db} | 3 | 97 | 100 | 100 |
| PBA Rana ^{db} | 3 | 90 | 90 | 92 |
| PBA Marne ^{db} | 3 | 96 | 104 | 101 |
| PBA Bendoc ^{db} | 2 | – | 99 | 102 |
| Nura ^{db} | 3 | 103 | 95 | 98 |
| Fiesta VF | 3 | 112 | 94 | 98 |
| Farah ^{db} | 3 | 111 | 95 | 99 |

TABLE 6 South-east faba bean yield performance. NVT data 2014–18.

Long-term yield expressed as a percentage of mean yield.

| Variety | Year | 2014 | 2015 | 2016 | 2017 | 2018 |
|---------------------------|-----------------|------|------|------|------|------|
| | Mean yield t/ha | 2.22 | 1.55 | 4.89 | 3.37 | 3.03 |
| | No. trials | 5 | 4 | 5 | 5 | 4 |
| PBA Amberley [Ⓛ] | 21 | 102 | 102 | 104 | 100 | 95 |
| PBA Zahra [Ⓛ] | 23 | 106 | 107 | 105 | 104 | 102 |
| PBA Samira [Ⓛ] | 23 | 104 | 105 | 103 | 102 | 100 |
| PBA Rana [Ⓛ] | 23 | 93 | 85 | 96 | 91 | 91 |
| PBA Marne [Ⓛ] | 23 | 92 | 94 | 97 | 98 | 99 |
| PBA Bendoc [Ⓛ] | 14 | – | – | 98 | 105 | 106 |
| Nura [Ⓛ] | 23 | 94 | 87 | 96 | 96 | 96 |
| Fiesta VF | 20 | 104 | 102 | 97 | 100 | 101 |
| Farah [Ⓛ] | 23 | 102 | 99 | 97 | 100 | 101 |

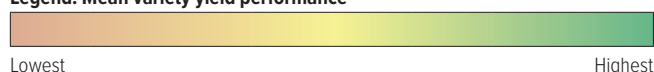
TABLE 7 Murray Mallee faba bean yield performance. NVT data 2014–17.

Long-term yield expressed as a percentage of mean yield.

Data for 2018 not available due to poor seasonal conditions.

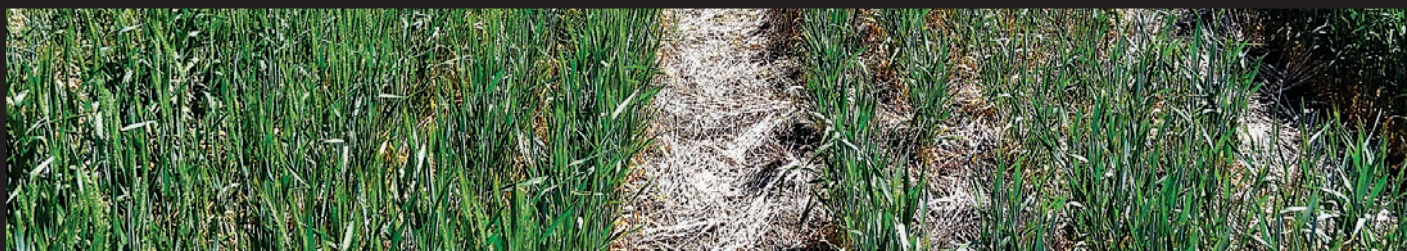
| Variety | Year | 2014 | 2015 | 2016 | 2017 |
|---------------------------|-----------------|------|------|------|------|
| | Mean yield t/ha | 0.93 | 0.86 | 3.68 | 2.03 |
| | No. trials | 1 | 1 | 1 | 1 |
| PBA Amberley [Ⓛ] | 3 | – | 99 | 104 | 100 |
| PBA Zahra [Ⓛ] | 4 | 87 | 84 | 104 | 99 |
| PBA Samira [Ⓛ] | 4 | 91 | 95 | 102 | 101 |
| PBA Rana [Ⓛ] | 4 | 69 | 93 | 88 | 88 |
| PBA Marne [Ⓛ] | 4 | 122 | 118 | 101 | 100 |
| PBA Bendoc [Ⓛ] | 2 | – | – | 105 | 108 |
| Nura [Ⓛ] | 4 | 87 | 81 | 96 | 88 |
| Fiesta VF | 4 | 95 | 97 | 97 | 105 |
| Farah [Ⓛ] | 4 | 95 | 92 | 97 | 101 |

Legend: Mean variety yield performance



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KNOW BEFORE YOU SOW



Cereal root diseases cost grain growers in excess of \$200 million annually in lost production. Much of this loss can be prevented.

Using PREDICTA® B soil tests and advice from your local accredited agronomist, these diseases can be detected and managed before losses occur. PREDICTA® B is a DNA-based soil-testing service to assist growers in identifying soil borne diseases that pose a significant risk, before sowing the crop.

Enquire with your local agronomist or visit

http://pir.sa.gov.au/research/services/molecular_diagnostics/predicta_b

Potential high-risk paddocks:

- Durum crops (crown rot)
- Newly purchased or leased land
- Bare patches, uneven growth, white heads in previous crop
- Paddocks with unexplained poor yield from the previous year
- Cereals on cereals
- Cereal following grassy pastures
- High frequency of root lesion nematode-susceptible crops, such as chickpeas
- Intolerant cereal varieties grown on stored moisture

There are PREDICTA® B tests for most of the soil-borne diseases of cereals and some pulse crops:

- Crown rot (cereals)
- Rhizoctonia root rot
- Take-all (including oat strain)
- Root lesion nematodes
- Cereal cyst nematode
- Stem nematode
- Blackspot (field peas)
- Yellow leaf spot
- Common root rot
- Pythium clade f
- Charcoal rot
- Ascochyta blight of chickpea
- White grain disorder
- Sclerotinia stem rot

LUPIN

By Amanda Pearce, SARDI, and Geoff Thomas, DPIRD

Lupin variety choice for South Australian growers will be the same in 2020, with no new varieties released for the Southern region in 2019.

AGT are managing the lupin breeding program for Australian growers. In September 2019 AGT released Coyote[®], a new variety mainly targeted for Western Australia. In the future their breeding program will be developing varieties for South Australia and the eastern states.

Narrow-leaved lupins (*Lupinus angustifolius*) are well suited to acidic and sandy soils. They continue to be grown in suitable areas as a key component of the farming system.

Recent improvements in grain pricing for lupins and a possible shift away from a heavy reliance on wheat/canola rotations is expected to see the area grown to lupins increase in coming seasons. There is also growing interest in developing the lupin crop for human consumption.

DOMESTIC MARKETING

For producers wanting to sell lupin grain into Victorian and New South Wales markets, they must satisfy Anthracnose freedom, market access and transporting protocols. Anthracnose grain tests are the most common means of identifying Anthracnose freedom for marketing.

GRAZING OF LUPIN STUBBLES

Lupin stubbles can be a high-value feed source for livestock; however, growers have lost stock to lupinosis. This livestock health problem occurs when toxins are produced by the *Phomopsis* fungus that may develop in the lupin stem as the plant matures. Current varieties have levels of resistance that slow the development of the *Phomopsis* fungus. However, when significant rains occur before and after crop maturity, fungal development can occur regardless of the resistance level of the plant.

Care must be taken in grazing lupin stubbles and it may be advisable not to graze some paddocks at all should wet conditions prevail at or after harvest.

Lupin paddocks should be grazed at the first opportunity after harvest and stock should have access to a good-quality water supply. Older animals are less affected by lupinosis than young animals. Producers should note that bulky crops, crop-topping and tight lupin crop rotations aid the development of the fungus and can increase the risk of lupinosis.

LUPIN AGRONOMY

A common problem reported by SA growers is the poor emergence and establishment of lupin crops. This obviously affects crop establishment and early vigour, but it also enhances any effects of pre-emergent herbicides. Growers are encouraged to seek germination tests on sowing seed so that seeding rates can be increased to compensate for poor germination rates or alternative seed sourced.

Manganese deficiency has been a problem for a number of growers in recent seasons. Lupin plants have a high demand for manganese during seed development and maturity. Manganese deficiency can have a negative influence on seed development and cause seed to split or shrivel in pods. Deficient plants can be slow to ripen, remaining green for longer and causing difficulty at harvest. Manganese deficiency can be overcome by applying manganese. Timing is important and manganese should be applied at mid-flowering of the first lateral, by which time growth of the first pods on the main stem should be 2-2.5cm long.

NOTES ON CURRENT NARROW-LEAFED LUPIN VARIETIES

PBA Barlock[®]

PBA Barlock[®] (tested as WALAN2325) was released in WA in spring 2013. It is a high-yielding variety, which can provide a yield improvement in regions of SA. PBA Barlock[®] has improved metribuzin tolerance over the varieties Tanjil[®] and Wonga, allowing growers to use metribuzin for weed control. PBA Barlock[®] is MR to lodging in high rainfall regions, and shows improved pod shatter resistance compared to Mandelup[®], MR-MS. It is R to Anthracnose and MR to Phomopsis on stem. PBA Barlock[®] has its greatest long-term yield advantage over Mandelup[®] on the Eyre Peninsula. PBA Barlock[®] seed is available through Seednet.

PBA Bateman[®]

PBA Bateman[®] (tested as WALAN2533) was released in the eastern states in the spring of 2017. It is a high-yielding variety, which can provide a yield improvement in regions of SA. It is MR to anthracnose, similar to PBA Gunyidi[®] and Mandelup[®]. It is MR-MS to Cucumber mosaic virus (CMV) seed transmission, increased from PBA Jurien[®], PBA Gunyidi[®], Jenabillup[®] and Mandelup[®]. PBA Bateman[®] has similar agronomic features when compared to PBA Jurien[®]. PBA Bateman[®] shows similar tolerance to metribuzin as PBA Jurien[®], PBA Barlock[®] and PBA Gunyidi[®]. Seed is medium in size similar to Mandelup[®]. Growers should contact Seednet partners for supply of seed.

PBA Gunyidi[®]

PBA Gunyidi[®] (tested as WALAN2289) was released in WA in September 2011 as a potential Mandelup[®] replacement with improved resistance to pod shattering. This feature may enable growers to harvest later without incurring significant losses. PBA Gunyidi[®] is MR to Anthracnose and R to Phomopsis on stem. It flowers and matures slightly later than Mandelup[®]. It is R to metribuzin herbicide, but is less tolerant to Eclipse[®] and this herbicide should be used with care.

Jenabillup[®]

Jenabillup[®] has been extensively trialled in SA trials, where it typically has an advantage over Mandelup[®] in regions with a longer growing season. In these regions its extended flowering window can assist with increased yield. Jenabillup[®] flowers slightly later and for a longer period than Mandelup[®], making it less suitable to crop-topping. Jenabillup[®] does not have tolerance to metribuzin herbicide and has an S Anthracnose rating.

PBA Jurien[®]

PBA Jurien[®] (tested as WALAN2385) was released in WA in spring 2015. It can provide a yield improvement in regions of SA. It is R to anthracnose, Phomopsis on stem and grey spot. Although rated R to anthracnose, seed dressings are still recommended to reduce the risk of soil-borne disease. It is tolerant to metribuzin, superior to PBA Barlock[®]. PBA Jurien[®] has similar agronomic characteristics to PBA Gunyidi[®], flowering slightly earlier than PBA Barlock[®]. It is similar to Mandelup[®] in height and is MS to lodging in high-rainfall regions. PBA Jurien[®] has medium to large seed, similar to Mandelup[®], and the alkaloid content is similar to PBA Gunyidi[®]. Growers should contact Seednet Partners for supply of seed.

Mandelup[®]

Mandelup[®] is widely adapted to SA conditions and as such is established as a leading variety. Mandelup[®] is a tall variety, with good early vigour and very early flowering and maturity, making it well suited to low-medium rainfall districts in SA while still yielding well in higher rainfall areas. Its early maturity makes it suitable for crop-topping, with careful attention to correct timing. Mandelup[®] is MR to anthracnose. It is R to Phomopsis on stem. It can suffer pod loss/partial pod shattering with delayed harvest, and seed quality can suffer if wet conditions occur during harvest. Mandelup[®] seed is available in SA through Heritage Seeds Pty Ltd.

TABLE 1 Most adapted narrow-leaved lupin varieties for each rainfall zone.

| Rainfall zone (average annual rainfall) | | |
|---|---------------------------|---------------------------|
| Low < 375mm | Medium 375–500mm | High > 500mm |
| Mandelup ^{db} | Mandelup ^{db} | Jenabillup ^{db} |
| PBA Bateman ^{db} | PBA Bateman ^{db} | PBA Bateman ^{db} |
| PBA Barlock ^{db} | PBA Barlock ^{db} | PBA Barlock ^{db} |
| PBA Gunyidi ^{db} | PBA Gunyidi ^{db} | PBA Gunyidi ^{db} |
| PBA Jurien ^{db} | PBA Jurien ^{db} | PBA Jurien ^{db} |

TABLE 2 Agronomic features of narrow-leaved lupin varieties.

| Variety | Plant height | Flowering | Lodging | Pod shatter | Anthracnose | Spot | | CMV (seed) | Phomopsis | | BYMV |
|---------------------------|--------------|------------|---------|-------------|-------------|-------|-----------|---------------|-----------|------|------|
| | | | | | | Brown | Grey Leaf | | Stem | Pod | |
| Jenabillup ^{db} | Tall | Mid | MSMR | MS | MS | MRMS | R | MS | S | MR | MR |
| Mandelup ^{db} | Tall | Very early | MS | MS | MR | MS | R | MS | R | MRMS | S |
| PBA Barlock ^{db} | Med | Mid | MR | MRMS | R | MS | R | MR | MR | MR | MS |
| PBA Bateman ^{db} | Tall | Early | MRMS | MRMS | MRMS | MS | R | MR | MR | MRMS | MR |
| PBA Gunyidi ^{db} | Med | Early | MR | MR | MR | MS | S | MS | R | MR | MS |
| PBA Jurien ^{db} | Tall | Early | MS | MRMS | R | MS | R | MS | R | MRMS | MR |

SOURCE: AGRICULTURE AND FOOD, DPIRD WESTERN AUSTRALIA AND PBA LUPIN BREEDING PROGRAM, SOUTH PERTH, WA, 2013–2016

Key: R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible

TABLE 3 Mid North lupin yield performance. NVT data 2014–18.

Long-term yield expressed as a percentage of mean yield.

| Variety | Year | 2014 | 2015 | 2016 | 2017 | 2018 |
|---------------------------|-----------------|------|------|------|------|------|
| | Mean yield t/ha | 1.58 | 1.22 | 2.83 | 1.98 | 1.49 |
| | No. trials | 1 | 1 | 1 | 1 | 1 |
| Coyote ^{db} | 4 | – | 115 | 120 | 122 | 105 |
| Jenabillup ^{db} | 5 | 103 | 96 | 84 | 107 | 88 |
| Jindalee | 4 | 88 | 92 | 75 | 99 | – |
| Mandelup ^{db} | 4 | 90 | 107 | 102 | 113 | – |
| PBA Barlock ^{db} | 4 | 103 | 93 | 101 | 104 | – |
| PBA Bateman ^{db} | 3 | – | 113 | 115 | – | 110 |
| PBA Gunyidi ^{db} | 4 | 105 | 105 | 111 | 107 | – |
| PBA Jurien ^{db} | 4 | 101 | 97 | 112 | 107 | – |
| Wonga | 5 | 91 | 90 | 89 | 108 | 101 |

Legend: Mean variety yield performance

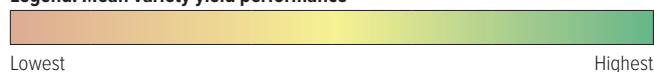


TABLE 4 Lower Eyre Peninsula lupin yield performance. NVT data 2014–18.

Long-term yield expressed as a percentage of mean yield.

| Variety | Year | 2014 | 2015 | 2016 | 2017 | 2018 |
|---------------------------|-----------------|------|------|------|------|------|
| | Mean yield t/ha | 1.82 | 1.53 | 2.32 | 1.11 | 2.90 |
| | No. trials | 2 | 2 | 1 | 1 | 1 |
| Coyote ^{db} | 6 | 106 | 115 | 115 | 116 | 129 |
| Jenabillup ^{db} | 7 | 97 | 100 | 104 | 109 | 119 |
| Jindalee | 6 | 84 | 89 | 84 | 98 | – |
| Mandelup ^{db} | 6 | 101 | 98 | 96 | 109 | – |
| PBA Barlock ^{db} | 6 | 103 | 97 | 108 | 103 | – |
| PBA Bateman ^{db} | 5 | 104 | 115 | 118 | – | 125 |
| PBA Gunyidi ^{db} | 6 | 103 | 106 | 107 | 104 | – |
| PBA Jurien ^{db} | 6 | 105 | 97 | 108 | 103 | – |
| Wonga | 7 | 95 | 88 | 96 | 104 | 103 |

TABLE 5 South East lupin yield performance. NVT data 2014–18.

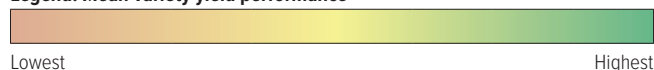
Long-term yield expressed as a percentage of mean yield.

| Variety | Year | 2014 | 2015 | 2016 | 2017 | 2018 |
|---------------------------|-----------------|------|------|------|------|------|
| | Mean yield t/ha | 1.05 | 0.65 | 3.12 | 1.94 | 1.42 |
| | No. trials | 2 | 1 | 3 | 2 | 1 |
| Coyote ^{db} | 7 | – | 114 | 109 | 121 | 134 |
| Jenabillup ^{db} | 9 | 103 | 104 | 99 | 104 | 111 |
| Jindalee | 8 | 96 | 66 | 82 | 93 | – |
| Mandelup ^{db} | 8 | 98 | 106 | 97 | 109 | – |
| PBA Barlock ^{db} | 8 | 99 | 103 | 105 | 101 | – |
| PBA Bateman ^{db} | 5 | – | 111 | 109 | – | 140 |
| PBA Gunyidi ^{db} | 8 | 103 | 103 | 105 | 107 | – |
| PBA Jurien ^{db} | 8 | 98 | 104 | 107 | 103 | – |
| Wonga | 9 | 94 | 86 | 94 | 99 | 115 |

TABLE 6 Murray Mallee lupin yield performance. NVT data 2014–16.

Long-term yield expressed as a percentage of mean yield.

| Variety | Year | 2014 | 2015 | 2016 |
|---------------------------|-----------------|------|------|------|
| | Mean yield t/ha | 1.29 | 0.91 | 2.82 |
| | No. trials | 1 | 1 | 1 |
| Coyote ^{db} | 2 | – | 112 | 115 |
| Jenabillup ^{db} | 3 | 95 | 100 | 93 |
| Jindalee | 3 | 71 | 86 | 73 |
| Mandelup ^{db} | 3 | 109 | 106 | 111 |
| PBA Barlock ^{db} | 3 | 100 | 95 | 98 |
| PBA Bateman ^{db} | 2 | – | 110 | 109 |
| PBA Gunyidi ^{db} | 3 | 103 | 103 | 105 |
| PBA Jurien ^{db} | 3 | 106 | 96 | 105 |
| Wonga | 3 | 88 | 88 | 87 |

Legend: Mean variety yield performance

OAT

By Pamela Zwer, Sue Hoppo, Peter McCormack, Mark Hill, Peter Wheeler, KerryLee McMurray, and Michelle Williams, SARDI

The oat variety descriptions in this publication serve as a guide to select oat varieties for specific end-uses with disease resistance, agronomic traits, and yield potential suited to diverse south-eastern Australian farming systems.

HOW TO USE THE OAT VARIETY SOWING GUIDE

Varieties adapted to low, medium, and high-rainfall regions and categorised by grain and hay end-use are shown in Table 1. Select the group of varieties suited to your rainfall region and end-use. Consult Tables 2 to 7 to refine the list to one or two varieties. Consult Tables 2 and 3 for hay and grain production comparisons, Table 4 for agronomic features, Table 5 for disease resistance, Table 6 for grain quality and Table 7 for hay quality. Certain varieties are preferred for particular end-uses, so check with hay processors and millers prior to variety selection.

IS CEREAL CYST OR STEM NEMATODE A PRODUCTION CONSTRAINT?

Cereal cyst nematode (CCN) and Stem nematode (SN) are major soil-borne diseases limiting the yield of oats in certain areas of southern Australia. Due to the significant effect of CCN and SN on varietal performance, soil testing is recommended to assess if either of these nematodes will be a significant problem. The PREDICTA® B Root Disease Testing Service (RDTS) provides a diagnostic service to assess the levels of both nematodes prior to sowing. This is available through your local accredited agronomist or contact Alan Mackay (SARDI Plant and Soil Health ph. 08 8429 2216) for your local accredited agronomist.

Varieties contained in Table 1 provide options for different end-uses. Table 5 should then be used in conjunction with this table to determine if the variety of choice has both resistance and tolerance to CCN if it is a problem or resistance and tolerance to SN

if it is a problem. Varieties grown where CCN or SN is present should be resistant to the particular nematode which is a problem so that multiplication of the nematode is limited. The variety should also be tolerant so that it yields well in the presence of the nematode. ***Yield penalties of up to 80 per cent can occur if an intolerant variety is sown in a paddock where CCN or SN is a problem.***

There are eight varieties resistant or moderately resistant to CCN listed in Table 5 and four of these are also tolerant. Tammar[®], Mulgara[®], Tungoo[®] and Wintaroo[®] are all varieties with both CCN resistance and tolerance. The remaining four resistant varieties, Yallara[®], Brusher[®], Durack[®] and Bannister[®], are intolerant of CCN. There are four varieties tolerant to Stem nematode. These are Tammar[®], Mulgara[®], Tungoo[®] and Wintaroo[®]. All of these are rated as resistant or moderately resistant to SN. Bannister is intermediate in its tolerance to SN and in cold wet seasonal conditions may suffer more yield loss than in warmer, drier winter conditions.

IS LEAF DISEASE A PRODUCTION CONSTRAINT?

Resistance to leaf diseases is important in most environments. However, even though varieties are listed as resistant to stem and Leaf rust, changes in rust pathotypes can occur. Recently a Stem rust pathotype was found in the southern region of South Australia causing all Stem rust resistance to be ineffective in the presence of this pathotype. Table 5 indicates a range of resistance reactions for Stem rust depending on whether the new pathotype of Stem rust is present or not. Monitoring of disease levels is essential and application of fungicide may still be required depending on seasonal conditions. Table 1 should be used to determine the variety options available for a particular end-use. Next, Table 5 should be used to further refine your choice. For example, if a variety for oat hay is required in a high-rainfall environment,

Forester[®], Tammar[®], Tungoo[®], Koorabup[®], Brusher[®], Mulgara and Wintaroo[®] are suitable (Table 1). Table 3 indicates that Wintaroo[®] is the highest yielding for hay in this environment. However, using Table 5 all other varieties have better resistance to both stem and Leaf rust. These varieties also vary in their level of resistance to Septoria, Barley yellow dwarf virus (BYDV), Bacterial blight and red leather leaf, which may be also be important. Table 4 should then be used to determine if the variety selected matures at the time required.

IS MILLING QUALITY REQUIRED?

The probability of a variety meeting the classification criteria for milling grade is an important consideration when selecting a variety for milling end-use. This is greatly influenced by seasonal conditions. Premium milling varieties such as Yallara[®], Mitika[®], Bilby[®], Kowari[®], Bannister[®] and Durack[®] will reach the classification criteria for milling grade more often than other varieties (Table 6). Although some other varieties are not considered milling class, they may reach milling grade criteria, but would not be accepted for milling. It is imperative that you check with your miller about the quality standards and varieties that are accepted for milling before you sow a grain crop for this end-use.

To select a variety for milling grain in medium to high rainfall zones you have the choice of Bilby[®], Kowari[®], Mitika[®], Yallara[®], Bannister[®], Williams[®] or Durack[®] (Table 1). Table 2 shows the relative yield and Table 6 the relative grain quality for each of these varieties. Using this information, choose a variety that suits your end-use based on whether yield or quality is a priority. Table 4 should also be used to determine if the variety selected matures at the time required, and Table 5 should be used to determine if the variety selected has the desired disease resistance.

IF EXPORT HAY QUALITY IS REQUIRED

Hay quality is essential to meet export hay standards and is greatly influenced by seasonal and nutritional conditions. However, some varieties are more likely to produce higher quality hay than others. It is imperative that you check with your hay processor about the quality standards required to make export-grade quality hay before you sow a hay crop. Use Table 7 to refine your choice after first ensuring that the criteria in Tables 1, 4 and 5 are met for your situation.

OATS FOR GRAZING

This guide contains no guidelines for oats suited to grazing plus feed grain production and repeated grazing from early sowing. A more comprehensive guide for grazing varieties is contained in the Winter Crop Variety Sowing Guide produced annually by NSW DPI. Please contact the National Oat Breeding Program for information on how to obtain a copy of this publication.

NOTES ON RECENTLY RELEASED VARIETIES

Fact sheets or pamphlets describing all varieties released by the South Australian based National Oat Breeding Program are available from Primary Industries and Resources (PIRSA), the South Australian Research and Development Institute (SARDI) website (www.pir.sa.gov.au/research) or from the relevant commercial partner for the variety. The herbicide tolerance of different oat varieties as well as yield and quality information for grain varieties is available on the NVT website www.nvtonline.com.au.

Milling varieties

Bilby[®]

Bilby[®], released in September 2019 by SARDI, is a dwarf, early to mid-season potential milling oat. Its height is similar to Mitika[®] and it is three days later to head. Bilby[®] has excellent grain yield and is similar to Williams[®] and Bannister[®] in SA, but with improved grain quality compared to these two varieties.

Bilby[®] has lower screenings, higher groat percent and higher protein content compared to Williams[®] and Bannister[®]. It has lower hectolitre weight and slightly higher screenings compared to Mitika[®] and Kowari[®]. Protein is similar to Mitika[®] and Kowari[®] and grain size is similar to Mitika[®] and bigger than Kowari[®], Bannister[®] or Williams[®]. Bilby[®] has high β -glucan and lower oil than other dwarf varieties with bright grain. Bilby[®] has improved Barley yellow dwarf virus resistance compared to other dwarf varieties. It is a cross between two breeders' lines and was tested as 06204-16. Heritage is the commercial partner.

Kowari[®]

Kowari[®], is a dwarf, early-maturing milling oat variety released by SARDI and measuring slightly taller than Mitika[®] in height. It has a maturity similar to Mitika[®]. Kowari[®] is a cross between Mitika[®] and WAOAT2099 and has similar grain yield to Mitika[®], but lower than Bannister[®] and Williams[®].

The grain quality is excellent. Kowari[®] has slightly lower hectolitre weight and grain weight when compared to Mitika[®]. It combines high β -glucan with low screenings. Kowari[®] has high protein and slightly higher groat percent compared to Mitika[®]. The trait of interest for this variety is improved β -glucan content. Heritage is the commercial partner.

Durack[®]

Durack[®] is an extremely early, moderately tall variety released in Western Australia and similar in height to Carrolup and Yallara[®]. This new variety is sown a minimum of one week earlier than any other variety released from the program.

Durack[®] has good lodging and shattering resistance and good early vigour. It is susceptible to very susceptible to Stem rust in South Australia and Victoria so a fungicide application will be mandatory if grown in areas where Stem rust is a problem. Durack[®] is rated resistant to susceptible for Leaf rust depending on which pathotype of the rust is present. Again, a fungicide may be required in Leaf rust prone areas.

Grain yield for this variety is similar to the tall varieties, Carrolup and Yallara[®], and an improvement compared to tall varieties bred for hay. Grain quality is excellent with high protein levels.

Hay yield averaged over low, medium, and high-rainfall sites is lower than other longer season varieties, and care will need to be taken to cut this very early maturing variety at the correct growth stage. Monitoring the crop will be the key to achieving the highest hay quality.

Williams[®]

Williams[®] is a tall milling variety commercialised by Heritage and released in Western Australia. It is also suited to eastern Australia because of its improved disease resistance profile. Williams[®] is a high-yielding early to mid-season variety with similar maturity compared to Yallara[®] and 15cm shorter. It is three to seven days later maturing than Mitika[®] and 15cm taller.

Williams[®] has the highest level of Septoria resistance compared to all other current milling oat varieties. It has similar grain yield to Bannister[®] with slightly inferior grain quality. Screenings can be high, especially in low rainfall regions. Williams[®] has high β -glucan levels.

Williams[®] averages slightly lower hay yield compared to other hay varieties. Hay quality is similar to Wintaroo[®] with slightly lower water-soluble carbohydrates and slightly higher crude protein.

Bannister[®]

Bannister[®] is a dwarf milling variety commercialised by Seednet and released in Western Australia but also suited to eastern Australia because of its improved disease resistance profile. Bannister[®] is high yielding and 13 cm taller than Mitika[®], heading about three to four days later than this variety. Bannister[®] has slightly lower hectolitre weight, slightly higher screenings and slightly lower groat percent compared to Mitika[®].

Mitika[®]

Mitika[®] is an early-maturing dwarf milling oat developed by SARDI and commercialised by Heritage Seeds. Mitika[®] is a milling-quality oat with high hectolitre and grain weight, low screenings percent and moderately high groat percent. It is also a high feed value oat with low hull lignin and high grain digestibility and is recommended for all rainfall zones where CCN or Stem nematode are not a problem.

Yallara[®]

Yallara[®] is a medium-tall milling oat variety developed by SARDI and commercialised by Seednet. Yallara[®] is a backcross line using EURO as the recurrent parent and a North Dakota line as the source of rust resistance. It is moderately resistant to Stem rust and resistant to Leaf rust. Yallara[®] is a premium-quality oat with the flexibility to cut for hay with fine stems and good hay quality. In addition, Yallara[®] has bright grain and high grain digestibility, making it suitable for the horse racing industry. Based on herbicide tolerance trials conducted by the SARDI Agronomy Group, Yallara[®] is particularly sensitive to applications of Banvel-M[®]. For more information about the herbicide tolerance of Yallara[®] go to www.nvtonline.com.au.

Hay varieties

Koorabup[®]

Koorabup[®] is a mid-tall hay variety with early mid to mid-season maturity developed for the WA market. It is similar in height, two to four days later in maturity and has similar grain yield and stem diameter compared to Yallara[®]. Hay yield is slightly higher than Carrolup, but lower than Yallara[®] and Brusher[®]. It has improved disease and grain quality compared to other current hay varieties and combines improved Septoria resistance with good rust and Bacterial blight resistances. It has excellent hay colour and hay quality and is similar to Wintaroo[®] across all traits except water-soluble carbohydrates, which average slightly lower in Victoria and WA. Grain quality is similar to Yallara but with a lower groat percent. It has low oil and bright grain. This line is a cross between two WA advanced breeding lines and is commercialised by AEXCO.

Mulgara[®]

Mulgara[®] is a tall mid-season hay oat similar in heading time and height to Wintaroo[®]. It is available to growers through AEXCO Pty Ltd. Mulgara[®] is an improvement compared to Wintaroo[®] for resistance to Stem rust and Bacterial blight. It is also an improvement compared to Wintaroo[®] for lodging and shattering resistance and early vigour. Hay yield is an improvement compared to Brusher[®] but is slightly lower than Wintaroo[®]. Hay quality is similar to Wintaroo[®]. Mulgara[®] has excellent hay colour and resists brown leaf at hay cutting. Grain yield and quality are similar to Wintaroo[®] with lower screenings and higher protein and groat percent. Mulgara[®] has high grain hull lignin. Mulgara[®] is recommended to replace Wintaroo[®] in areas with Stem nematode due to its higher level of resistance. It is also recommended to replace Wintaroo[®] where improved lodging resistance and Stem rust or Bacterial blight resistance is required. The seed size of Mulgara[®] is larger than other hay varieties described in this Sowing Guide. Care should be taken to sow this variety at the correct seed density.

Forester[®]

Forester[®] is a very late hay variety adapted to high rainfall and irrigated cropping regions. It is three weeks later to head compared to Wintaroo[®]. Forester[®] has excellent early vigour and lodging and shattering resistance. Forester[®] has an excellent foliar disease–resistance spectrum with good hay colour, but like all late hay varieties may not resist hot dry winds as well as earlier varieties. Forester[®] has excellent hay quality and seed is available from AGF Seeds.

Tammar[®]

Tammar[®] is a late tall hay oat variety later in cutting time than Kangaroo and Tungoo[®] but not as late as Forester[®]. It is available to growers through AEXCO Pty Ltd. Tammar[®] has excellent hay colour and resists brown leaf at hay cutting. Hay yields are slightly lower than Wintaroo[®] and similar to Tungoo[®] and Kangaroo. Grain yield is better than Kangaroo, and Tungoo[®]. Hay quality is better than Kangaroo and similar to Tungoo[®] and Wintaroo[®]. Tammar[®] has an excellent foliar disease–resistance profile and is an improvement compared to Tungoo[®] for Stem rust resistance. Tammar[®] is similar in height to Kangaroo, Tungoo[®] and Wintaroo[®] and has better lodging resistance than Tungoo[®] and Wintaroo[®] and better early vigour than Tungoo[®]. Tammar[®] has grain quality similar to Tungoo[®] and Kangaroo with slightly smaller grain weight and slightly more screenings. Tammar[®] is recommended for medium and high-rainfall zones and gives a slightly later option for cutting time than Tungoo[®] and Kangaroo.

Tungoo[®]

Tungoo[®] is a medium-tall, mid to late-season hay variety similar in heading date to Kangaroo. Seed of this line is available to growers through AEXCO Pty Ltd.

Tungoo[®] has an excellent disease-resistance profile and resists leaf browning from hot dry winds. It combines resistance and moderate tolerance to CCN and Stem nematode.

Hay yield is similar to Kangaroo with lower grain yield and quality. Hay digestibility is similar to Wintaroo[®] (better than Kangaroo), although it tends to be higher in neutral detergent fibre and lower in water-soluble carbohydrates than Wintaroo[®] but an improvement compared to Kangaroo. Early vigour is not as good as Kangaroo. It has moderately low hull lignin.

Brusher[®]

Brusher[®] is an early to mid-season tall oat developed by SARDI and commercialised by AEXCO Pty Ltd. It is two to four days earlier to head than Wintaroo[®] and this suits it well to low rainfall areas. Although Brusher[®] has inferior hay yield when compared to Wintaroo[®], it is recommended to replace this variety where improved resistance to stem and Leaf rust or improved hay quality is desired.

Grain yield and grain quality is similar to Wintaroo[®], Wallaroo[®] and Kangaroo with higher grain protein. Brusher[®] is moderately low in grain lignin.

KingBale

KingBale is a mid-flowering IMI tolerant oaten hay variety with improved tolerance to soil residual imidazolinone herbicides. It is an ideal variety for use where there are IMI residue concerns from previous crops. KingBale is a tall variety with good early vigour and is suitable for planting in the major hay growing regions of Australia. Preliminary data shows that KingBale has a similar disease and agronomic profile to Wintaroo[®] and indicates that it is resistant to CCN although rust (likely susceptible) will require proactive management. Yield information is currently limited. KingBale is a single gene IMI tolerant variety. The original breeding work was undertaken by Grains Innovation Australia (GIA) and the line is being commercialised by InterGrain. Commercial seed of KingBale will be available in 2021 subject to 2019 field testing results and an APVMA herbicide registration.

TABLE 1 Oat varieties listed according to annual rainfall.

Use Tables 2, 3, 4, 5, 6 and 7 to further refine your choice within each category.

| Rainfall zone (average annual rainfall) | | |
|---|-------------------------|-------------------------|
| Low < 375mm | Medium 375–500mm | High > 500mm |
| END USE – MILLING GRAIN | | |
| Bannister ^{db} | Bannister ^{db} | Bannister ^{db} |
| Bilby ^{db} | Bilby ^{db} | Bilby ^{db} |
| Durack ^{db} | Durack ^{db} | Kowari ^{db} |
| Kowari ^{db} | Kowari ^{db} | Mitika ^{db} |
| Mitika ^{db} | Mitika ^{db} | Williams ^{db} |
| Yallara ^{db} | Williams ^{db} | Yallara ^{db} |
| | Yallara ^{db} | |
| END USE – FEED GRAIN – SHEEP, CATTLE | | |
| Echidna ^{db} | Echidna ^{db} | Echidna ^{db} |
| Kowari ^{db} | Kowari ^{db} | Kowari ^{db} |
| Mitika ^{db} | Mitika ^{db} | Mitika ^{db} |
| Mulgara ^{db} | Mulgara ^{db} | Mulgara ^{db} |
| Wallaroo ^{db} | Wintaroo ^{db} | Wintaroo ^{db} |
| Wintaroo ^{db} | Yallara ^{db} | Yallara ^{db} |
| Yallara ^{db} | | |
| END USE – FEED GRAIN – PIGS, POULTRY | | |
| – | Numbat | Numbat |
| END USE – OAT HAY | | |
| Brusher ^{db} | Brusher ^{db} | Brusher ^{db} |
| Durack ^{db} | Durack ^{db} | Forester ^{db} |
| Koorabup ^{db} | Koorabup ^{db} | Koorabup ^{db} |
| Mulgara ^{db} | Mulgara ^{db} | Mulgara ^{db} |
| Wintaroo ^{db} | Tammar ^{db} | Tammar ^{db} |
| Yallara ^{db} | Tungoo ^{db} | Tungoo ^{db} |
| | Wintaroo ^{db} | Wintaroo ^{db} |
| END USE – HAY AND LEGUME MIXES | | |
| Brusher ^{db} | Brusher ^{db} | Forester ^{db} |
| Durack ^{db} | Koorabup ^{db} | Tammar ^{db} |
| Koorabup ^{db} | Mulgara ^{db} | Tungoo ^{db} |
| Mulgara ^{db} | Tungoo ^{db} | Williams ^{db} |
| Yallara ^{db} | Wintaroo ^{db} | |

TABLE 2 Five year (2014–18) average grain yield (t/ha) of oat varieties tested in grain trials.

| Variety | Yorke Peninsula | Mid North | South East | Murray Mallee | Average for all states |
|-------------------------|-----------------|-----------|------------|---------------|------------------------|
| SEMI-DWARF (HUSKED) | | | | | |
| Bannister ^{db} | 3.9 | 4.0 | 4.0 | 2.0 | 3.8 |
| Bilby ^{db} | 4.0 | 4.1 | 4.0 | 2.0 | 3.8 |
| Kowari ^{db} | 3.7 | 3.8 | 3.7 | 1.9 | 3.6 |
| Mitika ^{db} | 3.6 | 3.7 | 3.6 | 1.8 | 3.5 |
| SEMI-DWARF (NAKED) | | | | | |
| Numbat | 2.7 | 3.0 | 2.9 | 1.5 | 2.8 |
| TALL (HUSKED) | | | | | |
| Durack ^{db} | 3.0 | 3.4 | 3.3 | 1.7 | 3.2 |
| Koorabup ^{db} | 2.6 | 3.2 | 3.2 | 1.7 | 3.2 |
| Williams ^{db} | 3.5 | 3.9 | 3.8 | 2.0 | 3.6 |
| Yallara ^{db} | 2.7 | 3.2 | 3.2 | 1.6 | 3.0 |
| No. trials | 17 | 4 | 15 | 5 | 41 |

TABLE 3 Five-year (2014–18) average hay and grain production of oat varieties tested in hay trials.

| Variety | Hay yield (t/ha) | | | Grain yield (t/ha) | | |
|---|------------------|---------------------|-----------------|--------------------|---------------------|-----------------|
| | Rainfall zone | | | Rainfall zone | | |
| | Low < 375mm | Medium 375–500mm | High > 500mm | Low < 375mm | Medium 375–500mm | High > 500mm |
| SEMI-DWARF (HUSKED) | | | | | | |
| Bannister ^{db} | 7.6 | 9.0 | 11.1 | 3.2 | 4.2 | 4.4 |
| TALL (HUSKED) - EARLY TO MID-SEASON MATURITY | | | | | | |
| Brusher ^{db} | 8.0 | 9.1 | 11.2 | 2.1 | 2.9 | 3.0 |
| Durack ^{db} | 7.5 | 8.4 | 10.8 | 2.6 | 3.5 | 3.7 |
| Koorabup ^{db} | 7.4 | 8.7 | 10.6 | 2.6 | 3.4 | 3.7 |
| Mulgara ^{db} | 7.7 | 8.9 | 11.0 | 2.5 | 3.3 | 3.4 |
| Williams ^{db} | 7.3 | 8.9 | 10.8 | 3.1 | 4.1 | 4.4 |
| Wintaroo ^{db} | 8.2 | 9.5 | 11.5 | 2.5 | 3.3 | 3.4 |
| Yallara ^{db} | 7.9 | 9.3 | 11.4 | 2.6 | 3.5 | 3.6 |
| TALL (HUSKED) - MID LATE TO VERY LATE MATURITY | | | | | | |
| Forester ^{db} | NA | 9.5 | 10.8 | 1.8 | 2.5 | 2.6 |
| Tammar ^{db} | NA | 8.7 | 10.6 | 2.3 | 3.1 | 3.3 |
| Tungoo ^{db} | NA | 9.3 | 11.1 | 2.2 | 2.9 | 3.1 |
| No. trials | 9 | 19 | 8 | 32 | 113 | 40 |

TABLE 4 Agronomic features of varieties.

| Variety | Early vigour | Plant height | Heading | Maturity | Shattering resistance | Standing ability |
|----------------------------|--------------|--------------|---------|----------|-----------------------|------------------|
| SEMI-DWARF (HUSKED) | | | | | | |
| Bannister ^{db} | G | D | EM | EM | R | R |
| Bilby ^{db} | G | D | EM | EM | R | R |
| Kowari ^{db} | G | D | E | E | R | R |
| Mitika ^{db} | G | D | E | E | R | R |
| SEMI-DWARF (NAKED) | | | | | | |
| Numbat | MG | D | EM | EM | MR | R |
| TALL (HUSKED) | | | | | | |
| Brusher ^{db} | G | T | E | EM | MS | MS |
| Durack ^{db} | G | MT | VE | VE | MS | MR |
| Forester ^{db} | VG | MT | VL | VL | R | R |
| Kangaroo | MG | MT | ML | ML | MS | R |
| Koorabup ^{db} | M | MT | E-EM | EM | MS | MR |
| Mulgara ^{db} | G | T | EM | EM | MS | MR |
| Tammar ^{db} | M | MT | LM | LM | MS | R |
| Tungoo ^{db} | MP | MT | ML | ML | MS | MS |
| Williams ^{db} | G | ST | EM | EM | R | R |
| Wintaroo ^{db} | MG | T | M | EM | MS | MS |
| Yallara ^{db} | VG | MT | EM | EM | MR | R |

Value for trait: Early vigour: VG = very good, G = good, MG = moderately good, M = moderate, P = poor, MP = moderately poor

Plant height: D = dwarf, TD = tall dwarf, T = tall, ST = short tall, MT = moderate tall

Heading and maturity: VE = very early, E = early, EM = early mid, M = mid-season, ML = mid late season, LM = late mid-season, L = late, VL = very late

Shattering and standing ability: R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible

TABLE 5 Disease resistance of oat varieties – field reactions.

| Variety | Rust | | Barley yellow dwarf virus ² | CCN | | Stem nematode | | Septoria | Bacterial blight | Red leather leaf |
|------------------------|-------------------|-------|--|------------|-----------|---------------|-----------|----------|------------------|------------------|
| | Stem ¹ | Leaf | | Resistance | Tolerance | Resistance | Tolerance | | | |
| SEMI-DWARF (HUSKED) | | | | | | | | | | |
| Bannister [Ⓓ] | MR-S | R | MS | R | MI | — | MI | S | MR-S | MS-VS |
| Bilby [Ⓓ] | S | R | MR-MS | S | — | — | — | S | MS | R-MR |
| Kowari [Ⓓ] | MR-S | R | MS | S | — | — | I | S | MR | MR-VS |
| Mitika [Ⓓ] | MR-S | MS | S | VS | I | S | I | S | MR | R-MS |
| SEMI-DWARF (NAKED) | | | | | | | | | | |
| Numbat | MR-S | R | S | S | I | S | I | MR | S | R |
| TALL (HUSKED) | | | | | | | | | | |
| Brusher [Ⓓ] | MS-S | MR-MS | MS | R | MI | MS | I | MS | MR-MS | R-MSS |
| Durack [Ⓓ] | S-VS | R-S | MS | R | MI-MT | — | I | MS | MR-S | MS |
| Forester [Ⓓ] | R-S | MR-MS | MR-S | MS | MI | S | I | MR | MS-S | R-MS |
| Koorabup [Ⓓ] | R-S | MS-S | MS-S | S | — | — | MI | MR | MR | MS-VS |
| Mulgara [Ⓓ] | MS-S | MR | MS | R | MT | R | MT | MS | MR | MS-SVS |
| Tammar [Ⓓ] | MR-S | MR | MS | MR | MT | R | MT | MR | MR | MR-SVS |
| Tungoo [Ⓓ] | MS-S | MR | MR-MS | R | MT | R | MT | MR | MR | R-MS |
| Williams [Ⓓ] | MR-S | R | MR-MS | S | I | — | I | MR-MS | R | MR-SVS |
| Wintaroo [Ⓓ] | S | MS | MS-S | R | MT | MR | MT | MR-MS | MR | MR-SVS |
| Yallara [Ⓓ] | MR-S | R | MS | R | I | S | I | MS | MR-MS | MS-VS |

1 Disease reactions to Stem rust will vary with pathotype

2 Disease reactions to BYDV may vary with the strain of the virus

Key to symbols used: VS = very susceptible, S = susceptible, MS = moderately susceptible, MR = moderately resistant, R = resistant, VI = very intolerant, I = intolerant, MI = moderately intolerant, MT = moderately tolerant, T = tolerant, VT = very tolerant.

TABLE 6 Grain quality comparisons.

| Variety | Hectolitre weight (kg/hl) | Screenings <2mm | 1000 grain weight (g) | Kernel (%) | Probability of reaching milling grade | Protein (%) | Oil (fat) (%) | Hull lignin content |
|------------------------|---------------------------|-----------------|-----------------------|------------|---------------------------------------|-------------|---------------|---------------------|
| SEMI-DWARF (HUSKED) | | | | | | | | |
| Bannister [Ⓛ] | MH | ML | MH | MH | H | M | MH | H |
| Bilby [Ⓛ] | MH | ML | H | H | H | MH | ML | H |
| Echidna [Ⓛ] | M | H | M | ML | L | M | M | MH |
| Kowari [Ⓛ] | MH | L | H | H | H | MH | M | L |
| Mitika [Ⓛ] | H | L | H | MH | H | MH | M | L |
| SEMI-DWARF (NAKED) | | | | | | | | |
| Numbat | VH | H | L | – | – | H | VH | – |
| TALL (HUSKED) | | | | | | | | |
| Brusher [Ⓛ] | M | M | MH | M | – | MH | M | L |
| Durack [Ⓛ] | H | L | H | MH | H | MH | MH | H |
| Forester [Ⓛ] | L | M | L | L | – | M | M | H |
| Koorabup [Ⓛ] | H | L | H | ML | – | MH | L | H |
| Mulgara [Ⓛ] | M | M | MH | MH | – | MH | M | H |
| Tammar [Ⓛ] | L | H | L | ML | – | MH | M | SEG |
| Tungoo [Ⓛ] | L | H | L | ML | – | MH | M | L |
| Williams [Ⓛ] | MH | M | M | M | MH | M | M | MH |
| Wintaroo [Ⓛ] | M | M | MH | MH | – | M | M | L |
| Yallara [Ⓛ] | H | L | H | H | VH | MH | L | H |

Value for trait: L = low, ML = moderately low, M = medium, MH = moderately high, H = high, VH = very high, – = not applicable

TABLE 7 Hay quality comparisons.

| Variety | Digestible dry matter (%dm) | Crude protein (%dm basis) | Neutral detergent fibre (%dm basis) | Water-soluble carbohydrate (%dm basis) | Stem diameter |
|----------------------------|-----------------------------|---------------------------|-------------------------------------|--|---------------|
| SEMI-DWARF (HUSKED) | | | | | |
| Bannister ^{db} | H | H | ML | MH | M |
| TALL (HUSKED) | | | | | |
| Brusher ^{db} | MH | M | M | MH | M |
| Durack ^{db} | M | M | M | M | M |
| Forester ^{db} | MH | M | L | MH | MH |
| Koorabup ^{db} | MH | M | M | M | M |
| Mulgara ^{db} | M | M | M | M | M |
| Tammar ^{db} | M | MH | M | M | ML |
| Tungoo ^{db} | M | MH | M-MH | M | M |
| Williams ^{db} | M | H | M | M | MH |
| Wintaroo ^{db} | M | M | M | M | M |
| Yallara ^{db} | MH | M | ML | H | ML |

Value for trait: L = low, ML = moderately low, M = medium, MH = moderately high, H = high

NOTES ON INTERSTATE VARIETIES

Many of the varieties released interstate are evaluated in a limited number of trials in southern Australia. More information is available from the SARDI National Oat Breeding Program and should be sought before attempting to grow these varieties.

VETCH

By Stuart Nagel and Gregg Kirby, SARDI

Vetch is a multi-purpose crop grown mostly as a disease-break crop in rotation with cereals in a wide range of soil types from light sands to heavier clay soils. Common vetch varieties' (Languedoc, Blanche fleur, Morava[®], Rasina[®], Volga[®], Timok[®] and Cummins) versatility allows cropping for grain or hay production, early grazing as green pasture or for dry grazing, hay production or green manure.

Grain vetches have been grown in lower to mid-rainfall cereal areas of southern Australia, and their grain yields have been similar to pea yields in these areas. Note that vetch grain is not used for human consumption and can be used up to 20 per cent in pig rations.

Grain from Morava[®], Rasina[®], Volga[®] and Timok[®] can be used without limit to feed all ruminants and up to 20 per cent in the diet of pigs. These four varieties possess less toxin in grain (<0.65 per cent) compared with Blanche fleur (0.95 per cent) and Languedoc (1.65 per cent).

Forage vetches are used for hay, green manure or mid to late-winter feed for grazing. They are purple vetch (*Vicia benghalensis*) variety Popany or woolly pod vetch (*V. villosa* ssp.) varieties Namoi, Capello[®], Haymaker[®] and RM4[®]. Forage vetches can grow successfully in areas of 400 to 650mm of annual rainfall. Grain from woolly pod vetch varieties CANNOT be used to feed any livestock.

Vetch is valued for its benefits to subsequent cereal and oilseed crops in the rotation; these benefits are usually greater than from other pulses, particularly in lower rainfall areas. On sandy soils vetches provide better soil protection than peas and provide better stubble retention in the soil.

Morava[®], Rasina[®], Volga[®] and Timok[®] are resistant to rust and are the preferred varieties for grain in areas prone to rust infections. Disease management is critical when growing a vetch crop, regardless of the end-use, where possible disease-resistant varieties should be planted as a preference. Care must be taken when growing

rust susceptible varieties as grazing or feeding hay/silage from rust infected plants may induce abortions in pregnant livestock.

While it is usually not economically viable to use fungicides for rust on vetch, it may be necessary where rust susceptible varieties are to be used as feed.

Ascochyta blight occurs in earlier stages of the vetch crop and can reduce grain and dry matter production. This disease is generally less severe than Botrytis grey mould (BGM) which can develop high levels of infestation in cool/wet growing seasons.

There is little difference between vetch varieties in their resistance to BGM; varieties like Morava[®], which produce greater levels of vegetative growth and denser canopies, will be more prone to this disease in higher rainfall areas.

Vetch variety characteristics are summarised in the following tables:

Table 1 contains adaptation information for vetch varieties grown for grain and hay in different rainfall zones.

Table 2 contains information for selection of common and woolly pod vetch varieties for hay/silage, grazing and green manuring.

Table 3 provides varietal information on the most important criteria to consider for vetch grain and hay crops: yield potential, disease resistance, maturity, shattering resistance and hard seed percentage.

Table 4 displays yield results for grain and dry matter production of common vetches varieties tested between 2010 and 2014 in SA by the Australian National Vetch Breeding Program (ANVBP).

Table 5 provides dry matter yield results for woolly pod and purple vetch varieties tested from 2010 to 2014 in SA by ANVBP.

TABLE 1 Vetch grain variety rainfall zones.

| Rainfall zone (average annual rainfall) | | | | |
|---|----------------------|----------------------|----------------------|----------------------|
| <350mm | 350–400mm | 400–450mm | 450–600mm | >600mm |
| Cummins | Blanchefleur | Blanchefleur | Morava ^{db} | Morava ^{db} |
| Rasina ^{db} | Cummins | Cummins | Rasina ^{db} | Timok ^{db} |
| Timok ^{db} | Morava ^{db} | Morava ^{db} | Timok ^{db} | |
| Volga ^{db} | Rasina ^{db} | Rasina ^{db} | | |
| | Timok ^{db} | Timok ^{db} | | |
| | Volga ^{db} | Volga ^{db} | | |

TABLE 2 Vetch hay/silage/grazing and green manuring variety selection.

| Rainfall zone (average annual rainfall) | | | | |
|---|----------------------|------------------------|------------------------|------------------------|
| <350mm | 350–400mm | 400–450mm | 450–600mm | >600mm |
| Blanchefleur | Blanchefleur | Capello ^{db} | Capello ^{db} | Capello ^{db} |
| Cummins | Cummins | Haymaker ^{db} | Haymaker ^{db} | Haymaker ^{db} |
| Morava ^{db} | Morava ^{db} | Popany | Morava ^{db} | Morava ^{db} |
| Rasina ^{db} | Popany ^{db} | Morava ^{db} | Popany | Popany |
| RM4 ^{db} | Rasina ^{db} | Rasina ^{db} | RM4 ^{db} | Timok ^{db} |
| Timok ^{db} | RM4 ^{db} | RM4 ^{db} | Timok ^{db} | RM4 ^{db} |
| Volga ^{db} | Timok ^{db} | Timok ^{db} | | |
| | Volga ^{db} | Volga ^{db} | | |

TABLE 3 Characteristics of selected vetch varieties.

| Variety | Maturity | Yield potential | | Flower colour | % of | | Disease reaction | | |
|---|-----------|-----------------|------------|---------------|----------------|------------|------------------|-----------|----------|
| | | Grain | Dry matter | | Pod shattering | Hard seeds | Rust | Ascochyta | Botrytis |
| COMMON VETCH VARIETIES (VICIA SATIVA) | | | | | | | | | |
| Blanchefleur | Mid | High | Mod | White | 5–10 | 5–10 | VS | MS | S |
| Cummins | Mid-early | High | Mod | White | 5–10 | 5–15 | VS | MS | S |
| Morava ^{db} | Late | High | High | Purple | 0 | 0 | R | S | VS |
| Rasina ^{db} | Early-mid | High | Mod | Purple | 0–2 | 0 | R | MS | S |
| Timok ^{db} | Mid | High | V. high | Purple | 0–2 | 0–2 | R | MS | S |
| Volga ^{db} | Early | V. high | High | Purple | 0–2 | 2–5 | R | MS | S |
| PURPLE VETCH (VICIA BENGHALENSIS) | | | | | | | | | |
| Popany | Very late | Low | High | Purple | 20–30 | 5–10 | R | S | VS |
| WOOLLY POD VETCHES (VICIA VILLOSA SUBSP.) | | | | | | | | | |
| Haymaker ^{db} | Late | Low | Very high | Purple | 5–10 | 20–30 | R | S | VS |
| Capello ^{db} | Late | Low | Very high | Purple | 5–10 | 15–20 | R | S | VS |
| RM4 ^{db} | Mid | Moderate | Very high | Purple | 2–5 | 2–5 | R | MR | VS |

TABLE 4 Grain and dry matter yield for common vetch varieties (2010–14).

| (Five sites over five years) | | | | |
|------------------------------|--------------------|-------------------|-------------------------|-------------|
| Variety | Grain yield (t/ha) | % of Blanchefleur | Dry matter yield (t/ha) | % of Morava |
| Blanchefleur | 2.15 | 100 | 4.03* | 80 |
| Rasina ^{db} | 2.37 | 110 | 4.70* | 93 |
| Morava ^{db} | 2.16 | 100 | 5.06 | 100 |
| Timok ^{db} | 2.48 | 115 | 5.26 | 104 |
| Mean yield | 2.38 | | 4.91 | |

* 2009 to 2013

TABLE 5 Woolly pod vetch varieties (2010–14).

| Variety | Dry matter (t/ha) | % of Capello [Ⓛ] |
|-----------------------------|-------------------|---------------------------|
| Capello [Ⓛ] | 6.23 | 100.0 |
| Haymaker [Ⓛ] | 6.26* | 100.4 |
| RM4 [Ⓛ] | 6.71 | 107.7 |
| Mean yield | 6.4 | |
| PURPLE VETCH VARIETY | | |
| Popany | 5.28* | 84.75 |

* 2009 to 2012

TABLE 6 Plant density and recommended seeding rates for vetch.

| End-use | Common vetch varieties | | Woolly pod vetch varieties | | Purple vetch variety* | |
|--------------|-----------------------------------|---------------------|-----------------------------------|---------------------|-----------------------------------|---------------------|
| | Plants density (plants per sq.m.) | Sowing rate (kg/ha) | Plants density (plants per sq.m.) | Sowing rate (kg/ha) | Plants density (plants per sq.m.) | Sowing rate (kg/ha) |
| Grain | 40–60 | 40–50 | 40–50 | 25–40 | 40–50 | 25–40 |
| Hay/silage | 50–70 | 50–60 | 50–60 | 30–45 | 50–60 | 30–45 |
| Grazing | 50–70 | 50–60 | 50–60 | 30–45 | 50–60 | 30–45 |
| Green manure | 60–70 | 55–65 | 60–70 | 45–50 | 50–60 | 30–45 |

* in Australia Popany is the only purple vetch variety

Table 6 provides seeding rate recommendations for production of vetch grain, hay/silage, grazing and green manuring.

When selecting a vetch variety, growers also need to consider their individual farm and paddock situations and, most importantly, the intended end-use for the crop. Selections should be made using all of the available information.

NOTES ON VARIETIES

Common Vetch (*Vicia sativa*)

Languedoc

Languedoc is an early-flowering and maturing variety recommended for low-rainfall areas, although it can lodge severely, making harvest difficult under certain conditions. Languedoc generally exceeds Blanchefleur's grain yield in areas with less than 350mm rainfall. Its hard seed content is generally around five to 10 per cent and it is highly susceptible to rust. Languedoc grains possess 1.0–1.6 per cent anti-nutritional compound (BCN).

Blanchefleur

Prior to the release of Morava[Ⓛ], Blanchefleur was the preferred grain variety in areas above 350mm rainfall in SA. Blanchefleur has mid maturity, white flowers and reddish brown/mottled seed with orange cotyledons. Blanchefleur is very susceptible to rust.

It is well suited to medium to high-rainfall areas where rust is not a regular problem. Both vetch and

lentils are on the prescribed grain list of AQIS due to the vetch-lentil substitution issue. This has meant export markets of orange cotyledon varieties like Blanchefleur are limited to small bird seed markets in Europe and seed for grazing and green manure crops. Blanchefleur grains possess 0.9–1.6 per cent anti-nutritional BCN.

Cummins

A mid to early-maturing, white-flowering variety selected from Languedoc. It is well adapted to medium to low-rainfall areas where it generally yields higher than Blanchefleur. Cummins is susceptible to rust and moderately susceptible to Ascochyta blight. Cummins possess a similar percentage of BCN to Blanchefleur.

Morava[Ⓛ]

Morava[Ⓛ] is a rust-resistant late-flowering vetch variety with 100 per cent soft seeds, developed in 1998 by the Australian National Vetch Breeding Program (ANVBP) at SARDI. Grain yield is superior to other vetches in the high-rainfall areas and to Blanchefleur, Languedoc and Cummins in all other areas in the presence of rust. It is larger seeded and more resistant to shattering than other vetch varieties.

The BCN levels of Morava[Ⓛ] are 0.65 per cent, which is 50 per cent lower than Blanchefleur and Languedoc. Morava[Ⓛ] produces higher herbage yields than all other common vetch varieties.

Morava[Ⓛ] is later flowering and maturing than Blanchefleur and grain yield will be reduced in environments with dry finishes. Morava[Ⓛ]

is susceptible to Ascochyta blight and very susceptible to botrytis, because it produces very high biomass in wet/cool zones.

Morava[®] is a PBR variety and can be sourced from Heritage Seeds.

Rasina[®]

Rasina[®] is soft-seeded vetch from the ANVBP, developed in 2006. Rasina[®] replaces Languedoc, Blanchefleur and Cummins in low to medium-rainfall areas for grain production.

Rasina[®] is five to 10 days earlier than Blanchefleur and 10 to 15 days earlier than Morava[®]. A significant advantage over Languedoc, Blanchefleur and Cummins is Rasina[®]'s resistance to rust, and it is slightly more tolerant to Ascochyta blight and botrytis.

Rasina[®] is not expected to replace Morava[®] in higher rainfall districts or for hay production. The level of anti-nutritional factors in Rasina[®] is between 0.6 per cent and 0.8 per cent compared to 0.9 per cent to 1.6 per cent in Blanchefleur and Languedoc, respectively. Rasina[®] possesses a distinctive uniform dark-brown speckled seed coat with dark beige cotyledons. Rasina[®] is a PBR variety and can be sourced from Heritage Seeds.

Volga[®]

Volga[®] was developed in 2012 by the ANVBP at SARDI. It is a high-yielding grain/seed variety for low and mid rainfall areas. It is particularly suited to shorter season areas where the growing season finishes sharply: dry periods in September and October is a common issue in many low to mid-rainfall areas.

Volga[®] has good initial establishment, is rust-resistant, and earlier flowering and maturing than Blanchefleur and Rasina[®]. It will improve the reliability of vetch and economic production in crop rotations especially in low and mid rainfall areas, 330 to 380mm per year.

Volga[®] has high grain and herbage yields and is well adapted to all areas where vetch is currently grown. Volga[®] is well suited to situations where the season finishes sharply because of its early flowering and maturity characteristics.

It can be successfully grown in many Australian soil types, from non-wetting sand to heavy clay loam with pH 5.8 to 9.4, like other common vetch varieties. Volga[®] is moderately susceptible to Ascochyta blight, whereas Morava[®] is susceptible. The early maturity of Volga[®] may limit yield potential relative to longer growing season varieties like Morava[®] in high-rainfall areas.

Toxin levels in the grain are around 0.54 per cent, lower than Morava[®] at 0.65 per cent and Blanchefleur 0.95 per cent. Volga[®] seed size is very similar to Morava[®] seeds (100 seed weight, 7.82g).

Volga[®] is a PBR variety and can be sourced from Heritage Seeds.

Timok[®]

Timok[®] was bred to complement Morava[®] in mid-high rainfall areas for grain/seed and especially for hay/silage production. Timok[®] yielded more grain than Rasina[®], Morava[®] and Blanchefleur by 9 per cent, 18 per cent and 21 per cent, respectively, over five years at five sites in SA (Table 4).

Timok[®] has better initial establishment than Morava[®] and will improve the reliability and economics of vetch production in crop rotations, especially in mid and high-rainfall areas, 350 to 450mm per year. Morava[®] will remain the preferred variety for hay/silage in rainfall areas with greater than 450mm per year.

Timok[®] is high-yielding, highly rust-resistant, moderately susceptible to Ascochyta blight, susceptible to botrytis. It has good early establishment and is a soft-seeded variety.

Timok[®] matures between Rasina[®] and Morava[®] (100 to 105 days from seeding to full flowering).

Timok[®] is very well adapted for grain production in rainfall areas greater than 380mm/year, and dry matter production is similar to Morava[®] in high rainfall regions (greater than 400mm/year). In low to medium rainfall regions (330 to 380mm/year) dry matter production from Rasina[®] is 19 per cent higher than Morava[®]. Timok[®] is a multi-purpose variety – it can be used for grain, hay/silage, grazing or green/brown manure.

Toxin levels in Timok[®] grain are around 0.57 per cent. Seed weight is 6.88g per 100 seeds, similar size to Rasina[®] at 6.92g per 100 seeds.

Timok[®] was developed in 2012 by the ANVBP at SARDI. Timok[®] is a PBR variety and can be sourced from Pasture Genetics.

Herbicide tolerance

There are no differences between common vetch varieties to registered herbicides for control of broad leaf weeds and no differences between varieties to registered herbicides for grass weed control.

Purple Vetch (*Vicia benghalensis*)

Popany

Popany (*Vicia benghalensis*) is a purple vetch variety. Grain yield is significantly lower than for common vetch varieties. Seeds are smaller than common vetch varieties, therefore the seeding rates are lower at approximately 30 to 35kg/ha.

Grain from this variety can be used as a bird feed in mixtures with other recommended grains. Popany is a late-maturing variety, requiring more than 125 days from seeding to podding. It is a good variety in mid to high-rainfall areas for hay/ silage. Popany possesses five to 10 per cent hard seeds. This variety is resistant to rust but susceptible to ascochyta and Chocolate spot. It has a black seed coat with distinctive white hilum.

Woolly Pod Vetches

Capello[®] and Haymaker[®]

(*Vicia villosa* subsp. *dasycarpa*). These woolly pod vetches are lower in grain yield compared with common vetches, but are much higher in dry matter production than common vetch varieties in rainfall areas greater than 450mm/year. Grain from these varieties cannot be used to feed any livestock.

Also, these varieties can only be grazed from the 10-node stage to podding stage. It is not recommended that grazing occur earlier or once plants begin to develop seeds in pods. These two varieties are very good for hay/silage production in areas with higher than 400mm of annual rainfall.

Haymaker[®] and Capello[®] are selected soft-seed varieties from Namoi. In past few years these two varieties have become prone to setting hard (dormant) seeds. Both varieties are owned by Heritage Seeds.

RM4[®]

RM4[®] (*Vicia villosa* subsp. *eriocarpa*) was selected by ANVBP at SARDI.

RM4[®] is high producer of dry matter, has very good early establishment, is moderately resistant to Ascochyta blight, and is susceptible to botrytis. It is a soft-seeded variety (greater than 94 per cent), emerges in 15 to 20 days and is earlier in maturity by 10 to 15 days than Haymaker[®] or Capello[®].

RM4[®] is significantly higher in dry matter production in mid to low-rainfall areas (less than 380mm/year) than Haymaker[®] or Capello[®]. RM4[®] is also suitable for higher rainfall areas (400 to 650mm/year).

RM4[®] is multipurpose variety that can be used for hay/silage, grazing, green/brown manure or for seed. RM4[®] can be successfully grown, like other woolly pod varieties, in many Australian soil types. Like other vetches, it is excellent for soil fertility/structure and nitrogen fixation. It can be grazed from 10 nodes up to the end of flowering and can be used for hay/silage production where cutting in full flowering provides the best balance of feed value. RM4[®] performs better in grain production than other woolly pod varieties when the season finishes sharply.

Herbicide tolerance: RM4[®] was not sensitive to any herbicides registered for use in woolly pod vetch varieties.

Insect pests: RM4[®] is susceptible in early growth stages to red-legged earth mite and lucerne flea like other woolly pod vetch varieties. RM4[®] is also susceptible to Blue-green and Cowpea aphids from early growth through to pod maturity, as well as to Native budworm during pod formation and filling.

Grain from this variety, like other woolly pod vetches, cannot be used to feed any livestock.

LENTIL

By Sarah Day, Penny Roberts, Jenny Davidson, Sara Blake, SARDI, and Arun Shunmugam, Agriculture Victoria

There are new lentil releases in 2019 and 2020. The first release in spring 2019 from the PBA breeding program. PBA Highland XT[®], tested as CIPAL1621, is a medium seed sized, herbicide tolerant red lentil variety. It is early flowering, early to mid-maturing and has performed well in the lower yielding environments of the Victorian Mallee and South Australia. PBA Highland XT[®] has good resistance (provisionally rated MR) to Ascochyta blight, maintaining this level of resistance against the increasingly prevalent pathogen isolates virulent on either PBA Hurricane XT[®] or Nipper[®]. In 2020 there will be more variety options available to growers wanting to utilise a herbicide-tolerant red lentil. In addition to the small red lentil PBA Hurricane XT[®], there will be two medium red lentil variety options, PBA Hallmark XT[®] (released in 2018) and PBA Highland XT[®]. For conventional options the high-yielding large red lentil, PBA Jumbo2[®] is broadly adapted across all lentil production zones.

PBA Hurricane XT[®] is rated as moderately resistant/moderately susceptible (MR-MS) to foliar Ascochyta blight (AB) in South Australia. It does not require fungicide sprays if no disease is visible. Early in the 2018 and 2019 growing seasons, aggressive lesions were observed on seedling crops and self-sown plants of PBA Hurricane XT[®], but drier than average conditions limited the disease spread. Growers are urged to monitor crops regularly for disease, and podding sprays may be required if disease is present during the growing season in this variety. The rapid and dominant uptake of PBA Hurricane XT[®], particularly on the Yorke Peninsula, threatens the longevity of the AB-resistance in this cultivar. It is important to diversify variety selections within a year and across rotations, alongside agronomic and disease-management practices to maintain the sustainability of the system and reduce the risk of crop failures.

Botrytis grey mould (BGM) continues to be a major disease limitation to SA lentil production and a foliar fungicide spray at the canopy closure stage in all varieties is recommended in conducive seasons and disease-prone areas. This is particularly important in varieties with low levels of resistance such as PBA Hurricane XT[®] but also in varieties with improved resistance to Botrytis grey mould (BGM) such as PBA Jumbo2[®], although follow-up sprays may not be needed in the latter. Early sowing is not recommended for varieties rated susceptible or moderately susceptible to BGM in disease-prone areas.

Price differences can occur between varieties across seasons; however, growers need to produce high-quality seed in all varieties to secure markets and achieve the highest prices. On-farm storage can assist in attaining the highest price for grain in some seasons and allow lentils with poor quality issues or contaminants to be stored until appropriate cleaning and marketing can occur. Timely harvesting is recommended in lentils to minimise seed discolouration and weather damage and also to reduce the risk of yield loss from shattering.

SELECTION CRITERIA

Information on the most important selection criteria, grain yield, disease resistance, maturity, lodging resistance, shattering and seed type for each variety can be found in Tables 1 and 2. When selecting a variety, growers also need to consider their individual farm and paddock situation and the access and availability of the likely target markets and make their selection on all available information. National Variety Trials yield data is summarised in Tables 3 to 7.

TABLE 1 Lentil variety sowing guide 2020.

| Rainfall zone (average annual rainfall) | | | |
|---|---------------------------------|---------------------------------|---------------------------------|
| <400mm | 400–450mm | 450–500mm | >500mm |
| SMALL RED | | | |
| Nipper ^{db} | Nipper ^{db} | Nipper ^{db} | Nipper ^{db} |
| Northfield | Northfield | Northfield | Northfield |
| PBA Bounty | PBA Bounty | PBA Bounty | PBA Bounty |
| PBA Herald XT ^{db++} | PBA Herald XT ^{db+} | PBA Herald XT ^{db+} | PBA Herald XT ^{db+} |
| PBA Hurricane XT ^{db+} | PBA Hurricane XT ^{db+} | PBA Hurricane XT ^{db+} | PBA Hurricane XT ^{db+} |
| MEDIUM RED | | | |
| Nugget | Nugget | Nugget | Nugget |
| PBA Ace ^{db} | PBA Ace ^{db} | PBA Ace ^{db} | PBA Ace ^{db} |
| PBA Blitz ^{db∞} | PBA Blitz ^{db∞} | PBA Blitz ^{db∞} | PBA Blitz ^{db∞} |
| PBA Bolt ^{db} | PBA Bolt ^{db} | PBA Bolt ^{db} | PBA Bolt ^{db} |
| PBA Flash ^{db} | PBA Flash ^{db} | PBA Flash ^{db} | PBA Flash ^{db} |
| PBA Highland XT ^{db+} | PBA Highland XT ^{db+} | PBA Highland XT ^{db+} | PBA Highland XT ^{db+} |
| LARGE RED | | | |
| Aldinga | Aldinga | Aldinga | Aldinga |
| PBA Jumbo ^{db} | PBA Jumbo ^{db} | PBA Jumbo ^{db} | PBA Jumbo ^{db} |
| PBA Jumbo2 ^{db} | PBA Jumbo2 ^{db} | PBA Jumbo2 ^{db} | PBA Jumbo2 ^{db} |
| MEDIUM & LARGE GREEN | | | |
| PBA Greenfield ^{db} | PBA Greenfield ^{db} | PBA Greenfield ^{db} | PBA Greenfield ^{db} |
| PBA Giant ^{db} | PBA Giant ^{db} | PBA Giant ^{db} | PBA Giant ^{db} |
| Boomer | Boomer | Boomer | Boomer |

♦ = not well suited to low rainfall areas or dry seasonal conditions due to low biomass type, must be sown early in these situations

∞ = variety best suited to crop-topping + = herbicide-tolerant variety

TABLE 2 Characteristics of selected lentil varieties.

| Variety | Seed coat colour | Cotyledon colour | Seed size relative to Nugget | Market category | Vigour | Plant height | Flowering time | Maturity time | Lodging resistance | Pod drop | Shattering | Botrytis grey mould | Ascochyta blight | |
|--------------------------------|------------------|------------------|------------------------------|-----------------|----------|--------------|----------------|---------------|--------------------|----------|------------|---------------------|------------------|-------|
| | | | | | | | | | | | | | Foliage | Seed |
| SMALL RED | | | | | | | | | | | | | | |
| Nipper ^{db} | Grey | Red | 75–80 | SRP | Poor/Mod | Short | Mid/Late | Mid | MR | MR | MR | R-MR | MR-MS | MR |
| PBA Herald XT ^{db} | Grey | Red | 75 | SR | Poor/Mod | Short | Mid/Late | Mid/Late | MR | MR | R | R-MR | R** | R |
| PBA Hurricane XT ^{db} | Grey | Red | 85 | SRP | Moderate | Medium | Mid | Mid | MR | MR | R | MR-MS | MR-MS* | MR |
| MEDIUM RED | | | | | | | | | | | | | | |
| Nugget | Grey | Red | 100 | MRS | Moderate | Medium | Mid | Mid/Late | MS | MR | R | MR-MS | MR-MS | MR-MS |
| PBA Ace ^{db} | Grey | Red | 100 | MRS | Good | Medium | Mid | Mid | MR-MS | R | MR-MS | MR-MS | R | R |
| PBA Blitz ^{db} | Grey | Red | 115–120 | MRS | Mod/Good | Med/Tall | Early | Early | MR | MR | MR | MR | MR | MR-MS |
| PBA Bolt ^{db} | Grey | Red | 100 | MRS | Mod/Good | Medium | Early/Mid | Early/Mid | R | R | R | S | MR | R-MR |
| PBA Flash ^{db} | Green | Red | 100–110 | MRS | Moderate | Medium | Early/Mid | Early/Mid | MR | MR | MR | MR-MS | MS | MS |
| PBA Hallmark XT ^{db} | Grey | Red | 105 | MRS | Mod/Good | Medium | Mid | Mid | MR | MR | R | R-MR | MR-MS* | MR |
| PBA Highland XT ^{db} | Grey | Red | 85–90 | MRS | Mod/Good | Medium | Early | Early/Mid | MR | MR | MR | MR-MS | MR | MR |
| LARGE RED | | | | | | | | | | | | | | |
| PBA Jumbo ^{db} | Grey | Red | 120 | LRS | Moderate | Medium | Mid | Mid | S | MR | MR | MS | MR-MS | S |
| PBA Jumbo2 ^{db} | Grey | Red | 120 | LRS | Mod/Good | Med/Tall | Mid | Mid | MR-MS | MR | R | R-MR | R | R |
| MEDIUM AND LARGE GREEN | | | | | | | | | | | | | | |
| Boomer | Green | Yellow | 150 | LG | Good | Tall | Mid | Mid/Late | S | R | S | MR-MS | MR | MR-MS |
| PBA Giant ^{db} | Green | Yellow | 170 | LG | Good | Tall | Mid | Mid/Late | S | R | MR-MS | MS | MR | MS |
| PBA Greenfield ^{db} | Green | Yellow | 130 | LG | Good | Tall | Mid | Mid/Late | MS | R | MR | MR | MR-MS | MR-MS |

R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible, I = intolerant, MI = moderately intolerant

Market category: MRS = medium red split, SRP = small red premium round (football), SR = small red round (football), LRS = large red split, LG = large green.

* Ascochyta foliage rating for PBA Hurricane XT is under observation: Isolated crops have developed moderately susceptible leaf lesions during 2016 and 2017

** PBA Herald XT has not been tested against new virulent isolates of Ascochyta blight. Growers should monitor the crop for disease and take appropriate disease-management strategies if required.

TABLE 3 Lower Eyre Peninsula lentil yield performance. NVT data 2014–18.

Long-term yield expressed as a percentage of mean yield.

| Variety | Year | 2014 | 2015 | 2016 | 2017 | 2018 |
|--------------------------------|-----------------|------|------|------|------|------|
| | Mean yield t/ha | 1.22 | 1.09 | 2.29 | 2.14 | 3.23 |
| | No. trials | 1 | 1 | 1 | 1 | 1 |
| PBA Jumbo2 ^{db} | 5 | 106 | 103 | 103 | 103 | 108 |
| PBA Jumbo ^{db} | 2 | 86 | 98 | – | – | – |
| PBA Hurricane XT ^{db} | 5 | 103 | 93 | 102 | 105 | 98 |
| PBA Highland XT ^{db} | 3 | – | – | 88 | 94 | 95 |
| PBA Herald XT ^{db} | 2 | 80 | 79 | – | – | – |
| PBA Hallmark XT ^{db} | 5 | 102 | 87 | 90 | 106 | 95 |
| PBA Flash ^{db} | 5 | 103 | 106 | 104 | 103 | 103 |
| PBA Bolt ^{db} | 5 | 102 | 100 | 96 | 101 | 96 |
| PBA Blitz ^{db} | 5 | 86 | 107 | 90 | 84 | 98 |
| PBA Ace ^{db} | 3 | 103 | 91 | 89 | – | – |
| Nugget | 5 | 92 | 95 | 94 | 107 | 99 |
| Nipper ^{db} | 5 | 83 | 91 | 99 | 93 | 97 |

TABLE 4 Mid North lentil yield performance. NVT data 2014–18.

Long-term yield expressed as a percentage of mean yield.

| Variety | Year | 2014 | 2015 | 2016 | 2017 | 2018 |
|--------------------------------|-----------------|------|------|------|------|------|
| | Mean yield t/ha | 1.74 | 1.75 | 2.47 | 1.81 | 1.51 |
| | No. trials | 3 | 4 | 4 | 4 | 4 |
| PBA Jumbo2 ^{db} | 19 | 106 | 108 | 125 | 105 | 109 |
| PBA Jumbo ^{db} | 12 | 106 | 97 | 92 | 101 | 101 |
| PBA Hurricane XT ^{db} | 19 | 95 | 97 | 103 | 98 | 99 |
| PBA Highland XT ^{db} | 14 | – | 109 | 100 | 100 | 106 |
| PBA Herald XT ^{db} | 11 | 78 | 78 | 97 | 87 | – |
| PBA Hallmark XT ^{db} | 19 | 99 | 100 | 114 | 97 | 105 |
| PBA Greenfield ^{db} | 12 | 102 | 99 | 123 | 103 | 109 |
| PBA Giant ^{db} | 7 | 103 | 95 | 93 | – | – |
| PBA Flash ^{db} | 19 | 105 | 103 | 92 | 104 | 102 |
| PBA Bolt ^{db} | 19 | 105 | 103 | 85 | 100 | 101 |
| PBA Blitz ^{db} | 19 | 104 | 100 | 95 | 99 | 96 |
| PBA Ace ^{db} | 15 | 108 | 102 | 102 | 103 | 110 |
| Nugget | 19 | 97 | 92 | 88 | 99 | 96 |
| Nipper ^{db} | 19 | 79 | 81 | 105 | 91 | 85 |

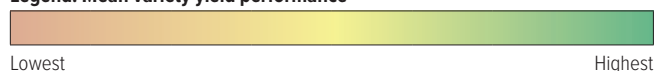
Legend: Mean variety yield performance

TABLE 5 Yorke Peninsula lentil yield performance. NVT data 2014–18.

Long-term yield expressed as a percentage of mean yield.

| Variety | Year | 2014 | 2015 | 2016 | 2017 | 2018 |
|--------------------------------|-----------------|------|------|------|------|------|
| | Mean yield t/ha | 2.12 | 1.54 | 3.45 | 2.43 | 1.63 |
| | No. trials | 5 | 5 | 5 | 5 | 5 |
| PBA Jumbo2 ^{db} | 25 | 109 | 109 | 122 | 108 | 108 |
| PBA Jumbo ^{db} | 16 | 102 | 102 | 95 | 103 | 99 |
| PBA Hurricane XT ^{db} | 25 | 95 | 94 | 96 | 97 | 97 |
| PBA Highland XT ^{db} | 17 | – | 109 | 103 | 101 | 105 |
| PBA Herald XT ^{db} | 14 | 77 | 78 | 91 | 82 | – |
| PBA Hallmark XT ^{db} | 25 | 97 | 97 | 103 | 98 | 98 |
| PBA Greenfield ^{db} | 14 | 102 | 99 | 111 | 107 | 102 |
| PBA Giant ^{db} | 10 | 98 | 96 | 87 | – | – |
| PBA Flash ^{db} | 25 | 104 | 103 | 94 | 104 | 104 |
| PBA Bounty | 2 | 101 | – | – | – | – |
| PBA Bolt ^{db} | 25 | 102 | 102 | 86 | 100 | 101 |
| PBA Blitz ^{db} | 25 | 105 | 107 | 108 | 99 | 100 |
| PBA Ace ^{db} | 19 | 103 | 100 | 91 | 106 | 103 |
| Nugget | 25 | 94 | 93 | 86 | 99 | 95 |
| Northfield | 4 | 87 | 88 | – | – | – |
| Nipper ^{db} | 25 | 82 | 83 | 104 | 88 | 84 |

TABLE 6 Murray Mallee lentil yield performance. NVT data 2014–18.

Long-term yield expressed as a percentage of mean yield.

Data for 2016 and 2017 not available due to poor seasonal conditions.

| Variety | Year | 2014 | 2015 | 2018 |
|--------------------------------|-----------------|------|------|------|
| | Mean yield t/ha | 0.99 | 0.70 | 0.73 |
| | No. trials | 1 | 1 | 1 |
| PBA Jumbo2 ^{db} | 3 | 115 | 99 | 98 |
| PBA Jumbo ^{db} | 2 | 92 | 69 | – |
| PBA Hurricane XT ^{db} | 3 | 102 | 95 | 118 |
| PBA Highland XT ^{db} | – | – | – | 123 |
| PBA Herald XT ^{db} | 2 | 76 | 48 | – |
| PBA Hallmark XT ^{db} | 3 | 111 | 98 | 133 |
| PBA Flash ^{db} | 3 | 100 | 101 | 87 |
| PBA Bolt ^{db} | 3 | 102 | 121 | 113 |
| PBA Blitz ^{db} | 3 | 89 | 108 | 71 |
| PBA Ace ^{db} | 2 | 112 | 78 | – |
| Nugget | 3 | 90 | 66 | 79 |
| Nipper ^{db} | 3 | 75 | 47 | 76 |

Legend: Mean variety yield performance

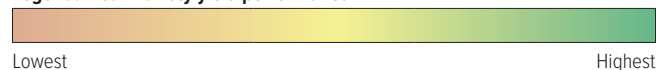
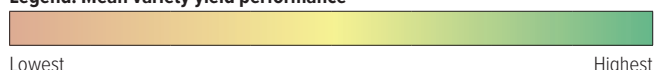


TABLE 7 South East lentil yield performance. NVT data 2014–18.

Long-term yield expressed as a percentage of mean yield.
Data for 2016 not available due to poor seasonal conditions.

| Variety | Year | 2014 | 2015 | 2017 | 2018 |
|-------------------------------|-----------------|------|------|------|------|
| | Mean yield t/ha | 0.64 | 0.93 | 2.58 | 2.13 |
| | No. trials | 1 | 1 | 1 | 1 |
| PBA Jumbo2 [Ⓢ] | 4 | 108 | 109 | 104 | 110 |
| PBA Jumbo [Ⓢ] | 2 | 66 | 89 | – | – |
| PBA Hurricane XT [Ⓢ] | 4 | 115 | 99 | 102 | 99 |
| PBA Highland XT [Ⓢ] | | – | – | 109 | 113 |
| PBA Herald XT [Ⓢ] | 2 | 89 | 77 | – | – |
| PBA Hallmark XT [Ⓢ] | 4 | 142 | 98 | 102 | 102 |
| PBA Greenfield [Ⓢ] | 2 | 88 | 94 | – | – |
| PBA Giant [Ⓢ] | 2 | 83 | 87 | – | – |
| PBA Flash [Ⓢ] | 4 | 85 | 102 | 98 | 103 |
| PBA Bolt [Ⓢ] | 4 | 114 | 100 | 103 | 106 |
| PBA Blitz [Ⓢ] | 4 | 76 | 96 | 95 | 94 |
| PBA Ace [Ⓢ] | 2 | 111 | 96 | – | – |
| Nugget | 4 | 72 | 89 | 85 | 84 |
| Nipper [Ⓢ] | 4 | 62 | 85 | 85 | 69 |

Legend: Mean variety yield performance

NOTES ON SELECTED VARIETIES

Small red lentils

PBA Hurricane XT[Ⓢ]

PBA Hurricane XT[Ⓢ] was the second lentil variety to be released with improved tolerance to the herbicides imazethapyr and flumetsulam, plus reduced sensitivity to some sulfonylurea and imidazolinone herbicide residues. However, it is important to note that product label rates, plant-back periods and directions for use must still be adhered to. It is a mid-flowering, mid-maturing variety with small red seed and a grey seed coat, although the seed size is slightly larger than Nipper[Ⓢ] and PBA Herald XT[Ⓢ]. PBA Hurricane XT[Ⓢ] has a MR-MS rating for foliar AB in South Australia, and severe lesions have occurred in seedling crops in 2018, so may require a podding spray to prevent seed and pod infection. PBA Hurricane XT[Ⓢ] has a MR-MS rating for BGM and in disease-prone areas a strategic fungicide programme for BGM will be required and early sowing should be avoided. Plant height and early vigour are improved over Nipper[Ⓢ] and PBA Herald XT[Ⓢ], improving weed competition and harvestability. Like PBA Herald XT[Ⓢ] and Nipper[Ⓢ], PBA Hurricane XT[Ⓢ] has been found to be more sensitive to Group C herbicides such as metribuzin and simazine than other lentil varieties; however, label rates of these herbicides have been used on most evaluation trials. It is important to be cautious when applying these herbicides on

variable soil types, especially if weather conditions conducive to crop damage are forecast. PBA Hurricane XT[Ⓢ] is the highest yielding small red lentil and is commercialised by PB Seeds.

PBA Herald XT[Ⓢ]

PBA Herald XT[Ⓢ] was the first lentil variety with improved tolerance to the herbicides imazethapyr and flumetsulam, plus reduced sensitivity to some sulfonylurea and imidazolinone herbicide residues. However, it is important to note that product label rates, plant-back periods and directions for use must still be adhered to. It is a mid to late-flowering and maturing variety with yields lower than PBA Hurricane XT[Ⓢ]. It is recorded as having high levels of disease resistance to AB (R) but has not been tested against the new virulent isolates. Growers need to monitor the crop for disease and take appropriate disease-management strategies if required. PBA Herald XT[Ⓢ] is R-MR to BGM, but disease monitoring and a fungicide application for BGM prior to canopy closure is still recommended. PBA Herald XT[Ⓢ] is more sensitive than most other varieties to group C herbicides such as metribuzin and simazine, and caution is urged with the application of these products, particularly on variable soil types. As a natural part of its genetic make-up PBA Herald XT[Ⓢ] has very low levels (0.1 per cent or less) of seed with a black seed coat, which is classified at receipt point with seeds of a contrasting colour limited at one per cent. PBA Herald XT[Ⓢ] is commercialised by PB Seeds.

Nipper[®]

Nipper[®] is rated R/MR to BGM and MR-MS to foliar AB infection similar to Nugget. However, in areas with reduced plantings of Nipper[®], the virulent ascochyta strain has recently become infrequent, and isolates capable of causing disease on PBA Hurricane XT[®] have not caused similar disease levels on Nipper[®] in controlled-environment testing. Crops should be monitored for presence of AB and strategic vegetative and podding sprays for AB are recommended in this variety in disease-prone areas if infection continues to spread. Nipper[®] has a small seed size similar to PBA Herald XT[®]. Nipper[®], like PBA Herald XT[®], flowers later than Nugget but often matures earlier. Nipper[®] is more sensitive to metribuzin than most other varieties and caution is required to avoid application when conditions are conducive to damage. Nipper[®] is licensed to Seednet.

Medium red lentils

PBA Highland XT

PBA Highland XT[®] will be the fourth lentil variety to be released with improved tolerance to the herbicides imazethapyr and flumetsulam, plus reduced sensitivity to some sulfonylurea and imidazolinone herbicide residues. However, it is important to note that product label rates, plant-back periods and directions for use must still be adhered to. PBA Highland XT[®] offers an improved herbicide-tolerant lentil that is showing adaptation to drier lentil growing regions of the Victorian Mallee and South Australia. It has medium seed size, high early vigour with early flowering and early to mid-maturity features. PBA Highland XT[®] has a provisional disease rating for AB of moderately resistant (MR) and moderately resistant/moderately susceptible (MR-MS) to BGM. These disease ratings are subjected to changes when more data become available.

PBA Ace[®]

PBA Ace[®] is a vigorous-growing, mid-flowering and mid-maturing variety with high yield potential and broad adaptation. It provides an alternative to Nugget in all regions. PBA Ace[®] has high resistance to AB and is rated MR-MS to BGM. PBA Ace[®] is one of the highest yielding medium red lentils in long term trials in all regions of SA and Victoria, but due to its later maturity than PBA Bolt[®], PBA Blitz[®] and PBA Flash[®], it is likely to be better suited to areas where mid-maturing varieties are favoured. PBA Ace[®] can be prone to lodging under conditions of high biomass production, often making BGM difficult to control. When grown in favourable

environments, particularly when sown early, a small reduction in seeding rate may be beneficial in this variety to reduce biomass and lodging. A small level of shattering has been observed under some conditions in PBA Ace[®] at maturity but it is unlikely to cause significant yield loss. PBA Ace[®] has a grey seed coat colour and is licensed to PB Seeds.

PBA Bolt[®]

PBA Bolt[®] is a mid-flowering but early to mid-maturing lentil with excellent lodging resistance at maturity and high yield in drought years and dry areas. It provides an alternative to PBA Flash[®] in all areas, particularly in areas where AB, harvestability and drought tolerance are major issues. Like PBA Flash[®] it has improved tolerance to boron and salt over most other varieties. PBA Bolt[®] has moderate resistance (MR) to AB but is susceptible (S) to BGM, and this disease will need to be carefully managed in disease prone areas. It has a grey seed coat colour and is licensed to PB Seeds.

PBA Blitz[®]

PBA Blitz[®] is suited to all current lentil-growing areas, with particular adaptation to shorter season areas, where its combination of early to mid-flowering, early maturity, moderate disease-resistance to both AB and BGM, and medium seed size will improve lentil reliability and economics of production. PBA Blitz[®] is the earliest maturing lentil variety and the best option where crop-topping and/or delayed sowing are practised. It has a good level of early vigour and an erect plant type. PBA Blitz[®] is a medium-sized red lentil (larger than PBA Flash[®] and Nugget) with a grey-coloured seed coat. PBA Blitz[®] has a low level of 'pale coat Blitz' seeds that still have red cotyledons and are a natural part of the genetic make-up of the variety. These do not affect the splitting or cooking characteristics of the variety. These 'pale coat Blitz' seeds are classified at receipt point as seeds of contrasting colour with a limit of one per cent allowed. PBA Blitz[®] is commercialised by PB Seeds.

PBA Flash[®]

PBA Flash[®] is a red lentil with a green seed coat and medium seed size. It has been well suited to shorter seasons and lower yielding lentil-growing areas where its earlier maturity improves reliability of yield. It is rated moderately susceptible (MS) to AB and requires strategic foliar fungicide sprays prior to flowering and at podding in disease-prone areas. Earlier maturity makes PBA Flash[®] better suited to crop-topping than Nugget and PBA Ace[®], although caution is still required with this practice due to seasonal variation in weed and crop maturity. PBA Flash[®] is rated MR-MS to BGM

but has improved tolerance to both boron and salt over all varieties except for PBA Bolt[®]. PBA Flash[®] is commercialised by PB Seeds.

PBA Hallmark XT[®]

PBA Hallmark XT[®] was the third lentil variety to be released with improved tolerance to the herbicides imazethapyr and flumetsulam, plus reduced sensitivity to some sulfonylurea and imidazolinone herbicide residues. However, it is important to note that product label rates, plant-back periods and directions for use must still be adhered to. PBA Hallmark XT[®] builds on PBA Herald XT[®] and PBA Hurricane XT[®], with higher grain yields and a different size market class. It is a mid-flowering, mid-maturing variety with medium red seed and a grey seed coat. The seed size is slightly larger than PBA Ace[®] and PBA Bolt[®] but less than PBA Flash[®] and PBA Blitz[®]. PBA Hallmark XT[®] has a high resistance rating for BGM, and is rated MR-MS for AB in South Australia where it may require a podding spray to prevent seed and pod infection. Like PBA Herald XT[®], Nipper[®] and PBA Hurricane XT[®], PBA Hallmark XT[®] has been found to be more sensitive to Group C herbicides such as metribuzin and simazine than other lentil varieties; however, label rates of these herbicides have been used on most evaluation trials. It is important to be cautious when applying these herbicides on variable soil types, especially if weather conditions conducive to crop damage are forecast. Vigour and plant height are slightly better than PBA Hurricane XT[®] and equivalent to PBA Bolt[®]. Similar lodging to PBA Hurricane XT[®], and can still lodge under some conditions. PBA Hallmark XT[®] is a high-yielding medium red lentil and is commercialised by PB Seeds.

Large red lentils

PBA Jumbo2[®]

PBA Jumbo2[®] is the highest yielding red lentil available for SA. PBA Jumbo2[®] was released as a direct replacement for PBA Jumbo[®] although grain size is almost the only similarity. It has improved agronomic characteristics over PBA Jumbo[®], including greater early vigour, improved lodging, shattering and disease resistance. It is rated R for AB and R-MR for BGM, but disease monitoring and a fungicide application prior to canopy closure are still recommended for the latter. It has a seed size and shape similar to PBA Jumbo[®] and Aldinga (20 per cent larger than Nugget) but with a grey seed. As with other large-seeded varieties PBA Jumbo2[®] is well suited to the post-harvest removal of small broadleaf weed seeds. PBA Jumbo[®] is licensed to PB Seeds.

PBA Jumbo[®]

PBA Jumbo[®] is a high-yielding large-seeded red lentil. PBA Jumbo[®] is moderately susceptible (MS) to BGM and this disease will need to be managed in disease-prone areas. It is rated MR-MS to AB and this will also need to be managed in conditions conducive to disease. PBA Jumbo[®] has moderate early vigour and is moderately susceptible to lodging. It has a seed size and shape similar to Aldinga (20 per cent larger than Nugget) but with a grey seed coat, and like Aldinga is well suited to the post-harvest removal of small broadleaf weed seeds. PBA Jumbo[®] is commercialised by PB Seeds.

Medium and large green lentils

PBA Giant[®]

PBA Giant[®] is the largest seeded Australian green lentil available. It is a broadly adapted variety with similar yield to Boomer but improved shattering resistance and produces a slightly larger and more consistent seed size. Although shattering resistance is improved over that of Boomer, it is rated MR-MS for this trait and timely harvest is important to prevent seed loss. PBA Giant[®] has moderate resistance (MR) to AB but is rated moderately susceptible (MS) to BGM, and therefore monitoring and timely application of fungicides will be important to ensure the control of disease. As pods are susceptible to AB infection, a strategic fungicide application at podding may also be required to minimise seed staining and maximise seed quality. The large seed size may provide opportunity for removal of small broadleaf weed seeds from the harvested sample. PBA Giant[®] is commercialised by PB Seeds.

PBA Greenfield[®]

PBA Greenfield[®] is the highest yielding Australian green lentil variety. It is a medium-sized green lentil with broad adaptation and good early vigour. It is rated MR-MS for AB, and is moderately resistant (MR) to BGM. PBA Greenfield[®] is mid-flowering and like the other green lentils has a mid to late-maturity rating. PBA Greenfield[®] has improved shattering resistance over both Boomer and PBA Giant[®] with an MR rating, but timely harvest is still important to produce good-coloured seed for ease of marketing. This may also be aided by strategic fungicide applications during podding to minimise seed staining from AB. PBA Greenfield[®] is commercialised by PB Seeds.

Boomer

Boomer was the first large-seeded green lentil, released as an Australian-adapted variety for all lentil-growing areas. Boomer has good early vigour and can produce large amounts of biomass, making it prone to lodging under favourable growing conditions. It is rated moderately resistant (MR) to foliar AB and MR-MS to BGM. Boomer is susceptible to pod infection from AB, and therefore this must be managed with strategic fungicides during podding to avoid disease staining on the seed coat. Boomer is rated susceptible to shattering at maturity, and therefore delayed harvest can result in grain loss and also a reduction of its green seed colour resulting in downgrading in this variety. Boomer is licensed to Seednet.

CHICKPEA

By Sarah Day, Penny Roberts, Jenny Davidson, SARDI, and Kristy Hobson, NSW DPI

All varieties are rated as either susceptible or moderately susceptible to *Ascochyta* blight (AB) infection. This follows observations of severe AB on previously resistant chickpea varieties in 2015 to 2019 across South Australia and Victoria. Chickpea growers now need to carefully consider their risk to AB infection along with the ability to effectively control the disease prior to choosing to grow this crop in southern Australia. This will be the case in both high and low-rainfall regions as severe disease outbreaks can still occur in the latter in all current variety options during wet seasons such as 2016.

It is imperative that all chickpea seed is treated with a thiram-based fungicide to prevent seed transmission of AB on to the emerging seedlings. The disease will also survive on stubble and organic matter for a number of years, so growers must observe a minimum of a three-year rotation between chickpeas in the same paddock, and avoid planting adjacent to last year's chickpea stubble.

All chickpea crops will need to be regularly monitored for AB infection. Moderately susceptible varieties will require three to four strategic fungicide sprays ahead of rain events, offering two to three weeks protection, starting at six to eight weeks post sowing. Susceptible varieties will require regular fungicide sprays every two to three weeks throughout the growing season in front of rainfall events. As the pods of all commercial varieties are susceptible to AB they will also require fungicide sprays during pod setting ahead of rain fronts to protect the pods from seed staining and seed abortion.

There are planned new chickpea releases from the PBA breeding program in 2019 and 2020, these releases include both kabuli and desi types. The first release is a medium kabuli, tested as CICA1156 and named PBA Royal[®]. It is an early to mid-

flowering type and has mid maturity. The seed is a medium-sized kabuli, with a seed size larger than Genesis 090 but smaller than PBA Monarch[®]. PBA Royal[®] is particularly well adapted to the medium-rainfall chickpea-growing regions (greater than 1.5 t/ha) of south-eastern Australia.

The other two releases are expected in 2020, one is a large-seeded kabuli, the other a desi that may have a fit for the lower rainfall environments, with more information to come closer to release.

Kabuli and desi chickpea variety options for southern region growers remain similar in 2020 with only one new variety release expected in 2019 suitable for southern chickpea-growing regions. With a combination of high yields, medium seed size and broad adaptation, PBA Monarch[®] continues to be good alternative to small-seeded kabuli varieties Genesis[™] 090 and Genesis[™] 079, and the large-seeded kabuli variety Genesis[™] Kalkee. However, PBA Monarch[®] is now rated susceptible to AB, compared to a rating of moderately susceptible in the other three varieties, making it a higher AB risk.

SELECTION CRITERIA

The list of suggested varieties for 2020 is shown in Table 1. A range of chickpea types is now available, offering growers the opportunity to exploit particular management and or market opportunities, providing AB can be managed effectively. Information on key selection criteria and yield for each variety can be found in Tables 2, 3 and 4. When selecting a chickpea type and variety to grow, growers need to make their decision on the basis of AB resistance, yield, price and marketability. Other agronomic traits such as maturity, cold tolerance, root lesion nematode susceptibility and lodging resistance also need to be considered.

TABLE 1 Chickpea variety sowing guide 2020.

| Rainfall zone (average annual rainfall) | | | |
|---|---------------------------|---------------------------|---------------------------|
| <400mm | 400–450mm | 450–500mm | >500mm |
| DESI | | | |
| PBA Slasher ^{db} | PBA Slasher ^{db} | PBA Slasher ^{db} | PBA Slasher ^{db} |
| PBA Striker ^{db} | PBA Striker ^{db} | PBA Maiden ^{db*} | PBA Maiden ^{db*} |
| PBA Maiden ^{db*} | PBA Maiden ^{db*} | PBA Striker ^{db} | Neelam ^{db} |
| Neelam ^{db} | Neelam ^{db} | Neelam ^{db} | Ambar ^{db} |
| Ambar ^{db} | Ambar ^{db} | Ambar ^{db} | |
| SMALL KABULI | | | |
| Genesis™ 090 | Genesis™ 090 | Genesis™ 090 | Genesis™ 090 |
| Genesis™ 079 | Genesis™ 079 | Genesis™ 079 | |
| MEDIUM/LARGE KABULI | | | |
| PBA Monarch ^{db} | Genesis™ Kalkee | Genesis™ Kalkee | Genesis™ Kalkee |
| PBA Royal ^{db} | PBA Monarch ^{db} | PBA Monarch ^{db} | PBA Monarch ^{db} |
| | PBA Royal ^{db} | PBA Royal ^{db} | PBA Royal ^{db} |
| | Genesis™ 114 | Genesis™ 114 | Genesis™ 114 |
| | Almaz ^{db} | Almaz ^{db} | Almaz ^{db} |

* high-quality seed type

TABLE 2 Agronomic features of chickpea varieties.

| Variety | Seed size (g/100 seeds) | Kabuli main seed size (mm) | Seed colour | Market type suitability | Early vigour | Flowering | Maturity | Plant height | Ascochyta blight | | Lodging resistance maturity | Pratylenchus neglectus | | Pratylenchus thornei | |
|---------------------------|-------------------------|----------------------------|-------------|-------------------------|--------------|-----------|----------|--------------|------------------|------|-----------------------------|------------------------|-----------|----------------------|-----------|
| | | | | | | | | | Foliage | Seed | | Resistance | Tolerance | Resistance | Tolerance |
| DESI TYPE | | | | | | | | | | | | | | | |
| Ambar ^{db} | 16 | – | light brown | split & whole | – | early | early | short-medium | S | S | MR | – | – | – | – |
| Neelam ^{db} | 17 | – | brown | split & whole | – | mid | mid | medium-tall | MS | S | MR | MRMS | – | MS | – |
| PBA Maiden ^{db} | 21–24 | – | yellow-tan | premium whole | moderate | early-mid | mid | short-medium | S | S | MS | MRMS | – | MRMS | – |
| PBA Slasher ^{db} | 17–19 | – | light brown | split & whole | poor/mod | mid | mid | short-medium | S | S | MS | MRMS | – | MRMS | – |
| PBA Striker ^{db} | 20–22 | – | light brown | split & whole | good | early | early | short-medium | S | S | MS | MRMS | – | – | – |
| KABULI TYPE | | | | | | | | | | | | | | | |
| Almaz ^{db} | 36–42 | 8–9 | cream | 8–9mm | poor | mid | mid-late | medium-tall | MS | S | MR | MRMS | – | VS | T |
| Genesis™ 079 | 24–28 | 6–7 | cream | 6–7mm | moderate | early | early | short | S | S | MR | MRMS | – | MS | – |
| Genesis™ 090 | 26–35 | 7–8 | cream | 6–8mm | good | mid | mid | medium | MS | S | MR | MRMS | – | MS | T |
| Genesis™ Kalkee | 40–46 | 8–9 | cream | 8–10mm | good | mid-late | late | tall | MS | S | R | MRMS | – | MS | – |
| PBA Monarch ^{db} | 37–43 | 8–9 | cream | 8–9mm | poor/mod | early | early | medium | S | S | MS | MRMS | – | MS | – |
| PBA Royal ^{db} | 35–40 | 8–9 | cream | 8–9mm | moderate | early-mid | mid | medium | MS | S | MR | MRMS | – | MS | – |

Key: R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible, VS = very susceptible, T = tolerant, MI = moderately intolerant, I = intolerant, NA = not available due to no data.

** AB disease ratings for southern region only

CHICKPEA TYPES

Desi types

Larger seeds are preferred for desi types, regardless of whether they are used for splitting or whole seed use. There has been an increasing use of large whole-seeded desi types in a range of food preparations in the sub-continent, and

a small premium has been available for types fitting this use. Newer desi varieties have improved seed size and colour over older varieties, such as Genesis™ 509 and Tyson, and are suited to whole and splitting markets. They are therefore more likely to achieve the higher prices of the benchmark northern region varieties (such as Jimbour).

TABLE 3 Mid North desi and kabuli chickpea yield performance. NVT data 2014–18.

Long-term yield expressed as a percentage of mean yield.

| Variety | Year | 2014 | 2015 | 2016 | 2017 | 2018 |
|---------------------------|-----------------|------|------|------|------|------|
| | Mean yield t/ha | 1.84 | 1.57 | 2.31 | | 0.55 |
| | No. trials | 2 | 2 | 1 | | 1 |
| DESI | | | | | | |
| Ambar ^{db} | 6 | 97 | 97 | 105 | – | 80 |
| Genesis™ 509 | 4 | 90 | 86 | 117 | – | 90 |
| Neelam ^{db} | 6 | 102 | 102 | 115 | – | 97 |
| PBA Maiden ^{db} | 6 | 104 | 106 | 96 | – | 97 |
| PBA Slasher ^{db} | 6 | 104 | 105 | 108 | – | 102 |
| PBA Striker ^{db} | 6 | 108 | 106 | 99 | – | 95 |
| KABULI | | | | | | |
| Variety | Mean yield t/ha | 2.07 | 2.39 | 1.38 | 2.96 | 2.74 |
| | No. trials | 2 | 2 | 1 | 1 | 1 |
| Almaz ^{db} | 7 | 96 | 97 | 122 | 100 | 100 |
| Genesis 079 | 7 | 109 | 96 | 82 | 105 | 98 |
| Genesis 090 | 7 | 104 | 99 | 104 | 108 | 100 |
| Genesis Kalkee | 7 | 95 | 97 | 89 | 98 | 96 |
| PBA Monarch ^{db} | 7 | 106 | 100 | 84 | 97 | 101 |
| PBA Royal ^{db} | 7 | 104 | 104 | 123 | 104 | 105 |

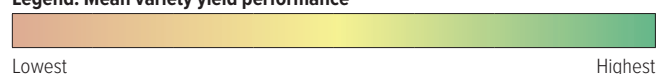
NVT are not designed to allow comparisons of varieties between desi and kabuli chickpeas where they are not evaluated in the same trial.
Data for desi in 2017 not available due to poor seasonal conditions.

TABLE 4 Yorke Peninsula desi and kabuli chickpea yield performance. NVT data 2014–18.

Long-term yield expressed as a percentage of mean yield.

| Variety | Year | 2014 | 2015 | 2016 | 2017 | 2018 |
|---------------------------|-----------------|------|------|------|------|------|
| | Mean yield t/ha | 2.17 | 1.45 | 2.32 | 2.28 | 1.21 |
| | No. trials | 2 | 2 | 2 | 2 | 2 |
| DESI | | | | | | |
| Ambar ^{db} | 10 | 100 | 100 | 109 | 104 | 99 |
| Genesis™ 509 | 5 | 91 | 91 | 116 | 104 | 89 |
| Neelam ^{db} | 10 | 102 | 106 | 119 | 108 | 102 |
| PBA Maiden ^{db} | 10 | 105 | 106 | 100 | 101 | 106 |
| PBA Slasher ^{db} | 10 | 103 | 106 | 112 | 105 | 104 |
| PBA Striker ^{db} | 10 | 108 | 109 | 96 | 103 | 107 |
| KABULI | | | | | | |
| Variety | Mean yield t/ha | 2.07 | 2.39 | 1.38 | 2.96 | 2.74 |
| | No. trials | 2 | 2 | 2 | 2 | 2 |
| Almaz ^{db} | 10 | 95 | 96 | 114 | 102 | 95 |
| Genesis™ 079 | 10 | 109 | 111 | 98 | 108 | 106 |
| Genesis™ 090 | 10 | 102 | 106 | 113 | 106 | 102 |
| Genesis™ Kalkee | 10 | 96 | 94 | 91 | 96 | 96 |
| PBA Monarch ^{db} | 10 | 107 | 105 | 88 | 100 | 105 |
| PBA Royal ^{db} | 10 | 102 | 106 | 118 | 106 | 103 |

NVT are not designed to allow comparisons of varieties between desi and kabuli chickpeas where they are not evaluated in the same trial.

Legend: Mean variety yield performance

Small kabuli types

Bulk markets for the small kabuli Genesis™ 090 have been developed in recent years and generally have attracted a higher price than the desi types. However, growers need to be aware that these bulk markets have been oversupplied in the past by a number of overseas countries and that they may have to hold seed from time to time as the marketing opportunities are not always available or they may be limited in terms of size and price. Seed size is small, 6 to 8mm, so will not attract the higher prices of the larger seeded kabuli types (such as PBA Monarch[®], Genesis™ Kalkee). Further premiums may be obtained by grading and selling the seed on size. Genesis™ 079 produces predominantly 6 to 7mm seed for the bulk small-kabuli markets and generally attracts a price at the bottom end of the Genesis™ 090 range.

Medium-large kabuli types

PBA Monarch[®], Almaz[®] and Genesis™ Kalkee produce predominantly 8 to 10mm seed for traditional larger seeded kabuli markets where larger seed size is imperative to attract premium prices. Uniformity of seed size is also important in these markets and may be difficult to achieve in the large types like Genesis™ Kalkee due to its relative poor adaptation to dry finishing conditions. The medium-sized type PBA Monarch[®] is likely to produce more uniform-sized seed under these conditions.

NOTES ON SELECTED DESI CHICKPEA VARIETIES

PBA Maiden[®]

PBA Maiden[®] is rated as susceptible to foliar infection by AB and will require regular vegetative and reproductive foliar fungicide sprays every two to three weeks. All chickpea seed should be treated with a thiram-based fungicide to prevent seed transmission of AB on to the emerging seedlings. PBA Maiden[®] is a large-seeded high-quality desi chickpea for the medium to low-rainfall environments of southern Australia. It is broadly adapted to these regions and has shown similar yields to PBA Slasher[®]. PBA Maiden[®] has a semi-spreading plant type and height similar to PBA Slasher[®]. It has a seed size greater than current southern desi varieties (approximately 30 per cent larger than PBA Slasher[®]) with a yellow-tan seed coat. This variety is targeted for whole-seed markets where its large, angular shaped and bright yellow-tan coloured seed coat are well suited to the specific requirements of these markets. Growers are advised to investigate delivery and marketing options for PBA Maiden[®]

prior to growing this variety, due to its unique and favourable seed characteristics. Larger uniform seed size is more likely in medium rainfall regions. Seed is licensed to Seednet.

PBA Striker[®]

PBA Striker[®] is susceptible to AB and will require regular vegetative and reproductive foliar fungicide sprays every two to three weeks. All chickpea seed should be treated with a thiram-based fungicide to prevent seed transmission of AB on to the emerging seedlings. PBA Striker[®] is a high-yielding desi chickpea with very good early vigour. It is an early-flowering and maturing variety and will provide a high-yielding alternative to all chickpea varieties in the medium to low-rainfall environments of western and southern Australia, providing AB can be managed. PBA Striker[®] has a similar plant type to PBA Slasher[®] but with larger seed size than all other southern desi varieties. Seed of PBA Striker[®] is also light in colour and has good milling characteristics. Due to its early maturity and AB susceptibility, PBA Striker[®] is not recommended for high-rainfall and long-growing season districts. Seed is licensed to Seednet.

Ambar[®]

Ambar[®] is an early-flowering and maturing desi type chickpea. It is rated as moderately susceptible to AB and will require three to four strategic fungicide sprays during the season ahead of rain fronts, the sprays offering two to three weeks protection against infection. All chickpea seed should be treated with a thiram-based fungicide to prevent seed transmission of AB on to the emerging seedlings. Ambar has had similar but generally lower yields than PBA Slasher[®] in southern Australia. It produces a short to medium canopy that can be difficult to harvest in some seasons and it has a seed size smaller than PBA Slasher[®] and PBA Striker[®] but light in colour. Seed is licensed to Heritage Seeds.

Neelam[®]

Neelam[®] is a mid-flowering and maturing desi type chickpea. It is rated as moderately susceptible to AB and will require three to four strategic fungicide sprays during the season ahead of rain fronts, the sprays offering two to three weeks protection against infection. All chickpea seed should be treated with a thiram-based fungicide to prevent seed transmission of AB on to the emerging seedlings. Neelam[®] has similar yields to PBA Slasher[®] but lower yields than PBA Striker[®] in South Australia and produces seed smaller than both these varieties. Neelam[®] has a medium-tall plant height, taller than Ambar[®] and PBA Slasher[®]. Seed is licensed to Heritage Seeds.

PBA Slasher[®]

PBA Slasher[®] is rated as moderately susceptible to AB and will require three to four strategic fungicide sprays during the season ahead of rain fronts, the sprays offering two to three weeks protection against infection. All chickpea seed should be treated with a thiram-based fungicide to prevent seed transmission of AB on to the emerging seedlings. PBA Slasher[®] is high yielding in all chickpea-growing areas of SA, providing AB can be managed. It has a semi-spreading plant type with mid flowering and mid maturity similar to Howzat. PBA Slasher[®] is suitable for both the split and whole seed markets as it has improved seed size and colour over varieties like Genesis™ 509 which are only suited to split seed markets. Seed is licensed to Seednet.

PBA Seamer[®], PBA HatTrick[®], PBA Pistol[®], PBA Boundary[®] and PBA Drummond[®]

These varieties have been released for northern NSW/southern Queensland (PBA Seamer[®], PBA HatTrick[®] & PBA Boundary[®]) and Central Queensland (PBA Pistol[®] and PBA Drummond[®]) where they offer specific production advantages. All four have limited suitability to SA and Victoria due to late maturity and low relative yields.

NOTES ON SELECTED KABULI CHICKPEA VARIETIES

PBA Royal[®]

PBA Royal[®] is a high-yielding medium-sized kabuli chickpea. It is particularly well adapted to the medium-rainfall chickpea-growing regions of south-eastern Australia. In these regions, it has improved grain yields in mid to high-yielding environments (greater than 1.5t/ha) compared to Genesis™ 090, PBA Monarch[®] and Genesis™ Kalkee. The provisional AB rating for PBA Royal[®] is moderately susceptible, similar to Genesis™ 090, and crops will now require three to four strategic fungicide sprays during the season ahead of rain fronts, the sprays offering two to three weeks protection against infection. All chickpea seed should be treated with a thiram-based fungicide to prevent seed transmission of AB on to the emerging seedlings. PBA Royal[®] has medium plant height with early to mid flowering and mid maturity. Seed is licensed to Seednet.

PBA Monarch[®]

PBA Monarch[®] is a high-yielding medium-sized kabuli chickpea with adaptation to all kabuli growing areas of Australia. The AB rating for PBA Monarch[®] is susceptible and crops will require regular vegetative and reproductive foliar fungicide sprays every two to three weeks. All chickpea seed should be treated with a thiram-based fungicide to prevent seed transmission of AB on to the emerging seedlings. It is particularly well suited to the shorter seasoned medium rainfall environments of south-eastern Australia due to improved adaptation through earlier flowering and maturity compared to Genesis™ 090, Almaz[®] and Genesis™ Kalkee. It is adapted to the traditional kabuli chickpea-growing regions and has shown a consistent and significant yield advantage over all current medium and large-seeded kabuli varieties, providing AB can be managed. It has similar yields and larger seed size than Genesis™ 090 although is higher yielding than this variety in low-yielding (<1 t/ha) situations. In shorter growing seasons, PBA Monarch[®] may have larger and more consistent seed size than other medium-sized varieties due to its earlier pod filling timing. Seed is licensed to Seednet.

Almaz[®]

Almaz[®] is a medium to large-seeded kabuli type. It is moderately susceptible to AB and will require three to four strategic fungicide sprays during the season ahead of rain fronts, the sprays offering two to three weeks protection against infection. All chickpea seed should be treated with a thiram-based fungicide to prevent seed transmission of AB on to the emerging seedlings. Almaz is a mid-flowering and mid to late-maturing variety and is lower yielding than Genesis™ 090 in southern Australia. Seed is licensed to Seednet.

Genesis™ 079

Genesis™ 079 is a high-yielding small-seeded kabuli type. It is rated as susceptible to AB and will require regular vegetative and reproductive foliar fungicide sprays every two to three weeks. All chickpea seed should be treated with a thiram-based fungicide to prevent seed transmission of AB on to the emerging seedlings. Genesis™ 079 has a short plant type and is an early-flowering and maturing variety that produces small seed (6 to 7mm), smaller than Genesis™ 090. It has produced high and consistent yields in medium and low-rainfall districts of SA. For seed distribution contact PB Seeds.

Genesis™ 090

Genesis™ 090 is a small to medium seeded kabuli (7 to 8mm). The AB rating for Genesis™ 090 is moderately susceptible and crops will now require three to four strategic fungicide sprays during the season ahead of rain fronts, the sprays offering two to three weeks protection against infection. All chickpea seed should be treated with a thiram-based fungicide to prevent seed transmission of AB on to the emerging seedlings. Genesis™ 090 has medium height with erect branches and yields similar to PBA Monarch[®] but lower than PBA Slasher[®] and PBA Striker[®]. For seed distribution contact PB Seeds.

Genesis™ Kalkee

Genesis™ Kalkee is a medium to large-seeded kabuli type, late in flowering and large in seed size. It is rated as moderately susceptible to AB and will require three to four strategic fungicide sprays during the season ahead of rain fronts, the sprays offering two to three weeks protection against infection. All chickpea seed should be treated with a thiram-based fungicide to prevent seed transmission of AB on to the emerging seedlings. It has the largest seed size of all commercial kabuli types, hence is more able to meet the size requirements of premium high-valued markets. However, yield is inferior to the small kabuli types and PBA Monarch[®] but generally similar to Almaz[®] in SA. For seed distribution contact PB Seeds.

FIELD PEA

By Sarah Day, Penny Roberts, Jenny Davidson, SARDI, and Gary Rosewarne and Babu Pandey, DEDJTR Victoria

The field pea variety options for the southern region growers remain the same in 2020 with no new variety releases expected in 2019. In the dun pea types, PBA Butler[®], released in 2017, provides a high-yielding 'Kaspa[®] type' field pea with improved resistance to Bacterial blight over Kaspa[®]. PBA Butler[®] is broadly adapted across all field pea production zones. In the lower yielding environments PBA Percy[®], a dimpled dun type, can still be the highest yielding dun type in the field pea variety trials. White and blue peas are not being accepted in the bulk dun segregation, and growers are advised to secure markets before deciding to grow these pea types. PBA Pearl[®], a white pea, is broadly adapted and yields well in all areas of SA.

The disease-forecasting model 'Blackspot Manager' predicted high Black spot risk levels in many regions of SA for the 2019 season since the extremely dry summer delayed fungal spore release until early winter. However, the dry growing conditions kept this disease at a minimum since it relies on rain splash to spread. In some regions delayed sowing until a reduced risk prediction occurs is possible; however, if the risk does not reduce and delayed sowing is not a viable option growers are advised to select another paddock or break crop to sow. If peas are still the preferred crop of choice, growers should select paddocks not previously sown to field peas, or paddocks with at least four years break from field peas and with a low history of Black spot disease infection. They should also not sow field peas in close vicinity to last year's field pea stubble, and in areas where a yield of at least 1.5t/ha is achievable they can consider using a fungicide strategy of P-Pickel T seed dressing combined with two foliar fungicide sprays (six to 10 weeks post sowing and again at early flowering). Predictions of Black spot spore release times in each pea growing district can be obtained through

'Blackspot Manager' via the internet (www.agric.wa.gov.au/cropdiseases) or a free SMS service (to subscribe email Jenny Davidson: jenny.davidson@sa.gov.au).

SELECTION CRITERIA

The list of suggested varieties is shown in Table 1 and is based on performance within different rainfall zones. Information on the most important agronomic characteristics is shown in Table 2 and grain yield for each variety can be found in Tables 3 to 8. When selecting a variety, growers need to make their selection on all the available information, including their individual farm and paddock situation, the access and availability of the target markets, and storage and handling facilities.

Due to white and blue peas not being accepted in the bulk dun segregation, growers need to also consider the different quality types within peas (Table 1) and where they can be delivered before deciding whether to grow these types.

NOTES ON SELECTED VARIETIES DUN TYPES

Dun peas are segregated from white and blue peas due to the different quality market specifications. Some pea markets in India and Sri Lanka prefer Australian dun peas due to their distinct 'nutty' taste. 'Kaspa[®] seed type' grain is also preferred over dimpled grain (such as Parafield and PBA Oura[®]) in these markets due to its round shape and lack of dimples, allowing easier seed coat removal and greater split returns. It is important to check segregation plans for local delivery points as some will segregate the 'Kaspa[®] seed type' from the dimpled dun type.

TABLE 1 Pea variety sowing guide 2020.

| Rainfall zone (average annual rainfall) | | | |
|---|---------------------------|---------------------------|---------------------------|
| <350mm | 350–425mm | 425–500mm | >500mm |
| DUN – 'KASPA' TYPE [†] | | | |
| Kaspa [†] | Kaspa [†] | Kaspa [†] | Kaspa [†] |
| PBA Gunyah [†] | PBA Butler [†] ^ | PBA Butler [†] ^ | PBA Butler [†] ^ |
| PBA Twilight [†] | PBA Gunyah [†] | PBA Gunyah [†] | PBA Gunyah [†] |
| PBA Wharton [†] | PBA Twilight [†] | PBA Twilight [†] | PBA Twilight [†] |
| | PBA Wharton [†] | PBA Wharton [†] | PBA Wharton [†] |
| DUN – OTHER | | | |
| PBA Coogee* | PBA Coogee* | PBA Coogee* | PBA Coogee* |
| PBA Oura [†] ^ | PBA Oura [†] ^ | PBA Oura [†] ^ | PBA Oura [†] ^ |
| PBA Percy [†] ^ | PBA Percy [†] ^ | PBA Percy [†] ^ | PBA Percy [†] ^ |
| Parafield | Parafield | Parafield | Parafield |
| WHITE | | | |
| PBA Hayman** | PBA Hayman** | PBA Hayman** | PBA Hayman** |
| PBA Pearl [†] | PBA Pearl [†] | PBA Pearl [†] | PBA Pearl [†] |
| BLUE | | | |
| Excell | Excell | Excell | Excell |
| Maki | Maki | Maki | Maki |

* Green manure/forage option

** Green manure/forage ONLY

^ Preferred varieties where Bacterial blight is a production constraint

TABLE 2 Variety characteristics of selected pea varieties.

| Variety | Seed type | Seed size | Plant habit | Plant height | Early vigour | Flower colour | Flowering time | Maturity time | Pod shattering, at maturity | Lodging resistance at maturity | Downy mildew | | Black spot | Powdery mildew | Bacterial blight (<i>pv syringae</i>) | Pea seedborne mosaic virus (PSBMV) | Bean leaf roll virus (BLRV) |
|---------------------------|-----------|-----------|-------------|--------------|--------------|---------------|----------------|---------------|-----------------------------|--------------------------------|------------------|---------------------------|------------|----------------|---|------------------------------------|-----------------------------|
| | | | | | | | | | | | Parafield strain | Kaspa [†] strain | | | | | |
| Kaspa [†] | Dun (K) | Me | SL | Me-T | High | Pi | L | M | R: SP | Fair-Good | MR | S | MS | S | S | S | S |
| Parafield | Dun | Me-Lg | C | T | High | P | M | M | MR: NSP | Poor | S | S | MS | S | MS | – | – |
| PBA Butler [†] | Dun (K) | Me | SL | Me-T | High | Pi | M-L | E-M | R: SP | Fair-Good | S | MS | MS | S | MR-MS | S | S |
| PBA Coogee | Dun | Lg | C | T | High | P | M | M | MR: NSP | Poor | – | – | MS | R | MS | – | – |
| PBA Gunyah [†] | Dun (K) | Me | SL | Me-T | High | Pi | E-M | E | R: SP | Fair-Good | R | S | MS | S | S | S | S |
| PBA Oura [†] | Dun | Me | SL | Me-T | High | P | E | E | MR: NSP | Fair-Good | MR | MR-MS | MS | S | MR-MS | S | R |
| PBA Pearl [†] | White | Me-Lg | SL | Me-T | High | W | E-M | E | MR: NSP | Good | MS | S | MR-MS | S | MS | S | R |
| PBA Percy [†] | Dun | Me-Lg | C | T | High | P | E | E | MR: NSP | Poor | S | S | MS | S | MR | S | S |
| PBA Twilight [†] | Dun (K) | Me | SL | Me-T | High | Pi | E | E | R: SP | Fair-Good | R | S | MS | S | S | S | – |
| PBA Wharton [†] | Dun (K) | Me | SL | Me-T | High | Pi | E-M | E | R: SP | Fair-Good | R | S | MS | R | S | R | R |

Key: K = Kaspa[†] type, Sm = small, Me = medium, Lg = large, C = conventional, SL = semi-leafless, P = purple, W = white, Pi = pink, T = tall, Sh = short, E = early, M = mid, L = late
H = high, M = moderate, L = low, S = susceptible, MS = moderately susceptible, MR = moderately resistant, R = resistant, SP = sugar pod, NSP = non-sugar pod

TABLE 3 Lower Eyre Peninsula field pea yield performance. NVT data 2014–18.

Long-term yield expressed as a percentage of mean yield.

| Variety | Year | 2014 | 2015 | 2016 | 2017 | 2018 |
|----------------------------|-----------------|------|------|------|------|------|
| | Mean yield t/ha | 2.03 | 1.45 | 2.52 | 1.71 | 2.27 |
| | No. trials | 2 | 2 | 2 | 2 | 2 |
| PBA Butler ^{db} | 10 | 108 | 106 | 103 | 103 | 107 |
| PBA Gunyah ^{db} | 10 | 97 | 97 | 93 | 102 | 98 |
| PBA Oura ^{db} | 10 | 101 | 104 | 112 | 99 | 99 |
| PBA Pearl ^{db} | 10 | 115 | 116 | 108 | 107 | 105 |
| PBA Percy ^{db} | 10 | 94 | 97 | 117 | 98 | 97 |
| PBA Twilight ^{db} | 4 | 95 | 95 | – | – | – |
| PBA Wharton ^{db} | 10 | 97 | 98 | 97 | 101 | 95 |
| Parafield | 8 | – | 79 | 96 | 80 | 85 |
| Kaspa ^{db} | 10 | 88 | 89 | 82 | 98 | 94 |

TABLE 4 Upper Eyre Peninsula field pea yield performance. NVT data 2015–18.

Long-term yield expressed as a percentage of mean yield.

Data for 2017 not available due to poor seasonal conditions.

| Variety | Year | 2015 | 2016 | 2018 |
|----------------------------|-----------------|------|------|------|
| | Mean yield t/ha | 1.65 | 2.88 | 0.39 |
| | No. trials | 1 | 1 | 1 |
| PBA Butler ^{db} | 3 | 106 | 102 | 103 |
| PBA Gunyah ^{db} | 2 | – | 97 | 100 |
| PBA Oura ^{db} | 3 | 94 | 93 | 106 |
| PBA Pearl ^{db} | 3 | 99 | 90 | 91 |
| PBA Percy ^{db} | 2 | – | 94 | 129 |
| PBA Twilight ^{db} | 2 | – | 94 | 93 |
| PBA Wharton ^{db} | 3 | 98 | 100 | 94 |
| Kaspa ^{db} | 3 | 102 | 92 | 96 |

TABLE 5 Mid North field pea yield performance. NVT data 2014–18.

Long-term yield expressed as a percentage of mean yield.

| Variety | Year | 2014 | 2015 | 2016 | 2017 | 2018 |
|----------------------------|-----------------|------|------|------|------|------|
| | Mean yield t/ha | 1.93 | 1.57 | 3.59 | 2.12 | 1.67 |
| | No. trials | 5 | 4 | 5 | 5 | 3 |
| PBA Butler ^{db} | 22 | 95 | 102 | 108 | 102 | 102 |
| PBA Gunyah ^{db} | 20 | 94 | 96 | 99 | 98 | 96 |
| PBA Oura ^{db} | 22 | 104 | 99 | 99 | 98 | 99 |
| PBA Pearl ^{db} | 22 | 103 | 106 | 102 | 103 | 103 |
| PBA Percy ^{db} | 20 | 97 | 89 | 103 | 93 | 93 |
| PBA Twilight ^{db} | 14 | 96 | 97 | 93 | 97 | 95 |
| PBA Wharton ^{db} | 22 | 107 | 101 | 93 | 101 | 100 |
| Parafield | 11 | 87 | 80 | 87 | 79 | 83 |
| Kaspa ^{db} | 22 | 86 | 91 | 95 | 92 | 91 |

Legend: Mean variety yield performance

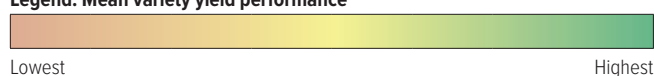


TABLE 6 Yorke Peninsula field pea yield performance. NVT data 2014–18.

Long-term yield expressed as a percentage of mean yield.

| Variety | Year | 2014 | 2015 | 2016 | 2017 | 2018 |
|---------------------------|-----------------|------|------|------|------|------|
| | Mean yield t/ha | 2.50 | 1.56 | 4.01 | 2.96 | 2.82 |
| | No. trials | 2 | 2 | 3 | 3 | 1 |
| PBA Butler [Ⓛ] | 11 | 105 | 107 | 113 | 106 | 103 |
| PBA Gunyah [Ⓛ] | 11 | 96 | 100 | 99 | 98 | 97 |
| PBA Oura [Ⓛ] | 11 | 98 | 96 | 101 | 94 | 98 |
| PBA Pearl [Ⓛ] | 11 | 103 | 104 | 110 | 101 | 98 |
| PBA Percy [Ⓛ] | 11 | 94 | 94 | 105 | 86 | 97 |
| PBA Twilight [Ⓛ] | 6 | 93 | 97 | 92 | 95 | – |
| PBA Wharton [Ⓛ] | 11 | 97 | 97 | 87 | 97 | 99 |
| Parafield | 7 | – | 76 | 93 | 78 | 87 |
| Kaspa [Ⓛ] | 11 | 90 | 96 | 97 | 94 | 93 |

TABLE 7 Murray Mallee field pea yield performance. NVT data 2014–17.

Long-term yield expressed as a percentage of mean yield.

Data for 2018 not available.

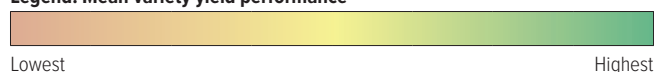
| Variety | Year | 2014 | 2015 | 2016 | 2017 |
|---------------------------|-----------------|------|------|------|------|
| | Mean yield t/ha | 1.20 | 1.13 | 2.85 | 1.08 |
| | No. trials | 1 | 1 | 1 | 1 |
| PBA Butler [Ⓛ] | 4 | 99 | 92 | 115 | 107 |
| PBA Gunyah [Ⓛ] | 4 | 90 | 97 | 100 | 95 |
| PBA Oura [Ⓛ] | 4 | 116 | 105 | 99 | 103 |
| PBA Pearl [Ⓛ] | 4 | 126 | 107 | 115 | 120 |
| PBA Percy [Ⓛ] | 4 | 106 | 99 | 96 | 92 |
| PBA Twilight [Ⓛ] | 2 | 91 | 102 | – | – |
| PBA Wharton [Ⓛ] | 4 | 104 | 113 | 88 | 99 |
| Parafield | 3 | – | 76 | 80 | 63 |
| Kaspa [Ⓛ] | 4 | 74 | 86 | 96 | 83 |

TABLE 8 South East field pea yield performance. NVT data 2014–18.

Long-term yield expressed as a percentage of mean yield.

Data for 2016 not available due to poor seasonal conditions.

| Variety | Year | 2014 | 2015 | 2016 | 2017 | 2018 |
|---------------------------|-----------------|------|------|------|------|------|
| | Mean yield t/ha | 1.09 | 1.19 | 3.99 | 3.07 | 2.86 |
| | No. trials | 1 | 1 | 1 | 1 | 1 |
| PBA Butler [Ⓛ] | 5 | 99 | 102 | 111 | 116 | 101 |
| PBA Gunyah [Ⓛ] | 5 | 102 | 97 | 96 | 97 | 94 |
| PBA Oura [Ⓛ] | 5 | 80 | 99 | 96 | 100 | 94 |
| PBA Pearl [Ⓛ] | 5 | 77 | 111 | 109 | 119 | 92 |
| PBA Percy [Ⓛ] | 5 | 79 | 88 | 88 | 93 | 87 |
| PBA Twilight [Ⓛ] | 2 | 102 | 98 | – | – | – |
| PBA Wharton [Ⓛ] | 5 | 108 | 103 | 93 | 88 | 100 |
| Parafield | 4 | – | 71 | 74 | 75 | 79 |
| Kaspa [Ⓛ] | 5 | 97 | 90 | 91 | 92 | 89 |

Legend: Mean variety yield performance

Kaspa[®] seed type

PBA Butler[®]

PBA Butler[®] is a 'Kaspa[®] type' field pea with high yields and improved resistance to Bacterial blight over Kaspa[®]. It is mid to late flowering, early to mid maturing and offers the same agronomic benefits of lodging and shattering resistance as Kaspa[®]. PBA Butler[®] has a medium seed size with a yellow split and a uniform tan seed coat colour that is similar to Kaspa[®]. It has a semi-leafless plant type with vigorous plant growth and is rated MS to Black spot and the 'Kaspa[®] strain' of downy mildew. PBA Butler[®] has wide adaptation across southern Australia and performs particularly well in medium to long-growing seasons in SA and may reduce yield losses in regions where Bacterial blight is a significant disease. Seed is available from the commercial partner Seednet.

PBA Wharton[®]

PBA Wharton[®] is a 'Kaspa[®] seed type' dun pea offering improved Powdery mildew and virus resistances (bean leaf roll and pea seed borne mosaic viruses). It provides the same agronomic benefits as Kaspa[®] (for example, lodging and shattering resistance), has some tolerance to boron toxicity, is moderately tolerant to salinity and will provide a reliable alternative in those areas where Powdery mildew and viruses are regular problems. PBA Wharton[®] is early to mid flowering and early maturing, making it well suited to the practices of crop-topping and delayed sowing for blackspot management. Seed is licensed to Seednet.

PBA Gunyah[®]

PBA Gunyah[®] is a 'Kaspa[®] seed type' field pea with earlier and longer flowering than Kaspa[®] and higher yield in shorter season environments and drier seasons (yield potential below 2.25t/ha) than this variety. It is early to mid flowering and early maturing, making it more suitable than Kaspa[®] to the practice of crop-topping. It is better suited to delayed sowing than Kaspa[®] for blackspot disease management. Its disease resistance profile is similar to Kaspa[®] and therefore not well suited to Bacterial blight-prone environments. Despite being susceptible to Powdery mildew it is likely that PBA Gunyah[®] will incur less yield loss from this disease than Kaspa[®] due to its earlier maturity. PBA Gunyah[®] is licensed to Seednet.

PBA Twilight[®]

PBA Twilight[®] is a 'Kaspa[®] seed type' with similar attributes to PBA Gunyah[®]. It has a shorter flowering period and is earlier in maturity than PBA Gunyah[®], making it well suited to the low rainfall and very short season field pea-growing environments. Widespread evaluation over a number of years shows that it is higher yielding than Kaspa[®] when yield potential is below 1.5t/ha. Its disease resistance profile is similar to Kaspa[®] and therefore not well suited to Bacterial blight-prone environments. Despite being susceptible to Powdery mildew it is likely that PBA Twilight[®] will incur less yield loss from this disease than Kaspa[®] due to its earlier maturity. PBA Twilight[®] is licensed to Seednet.

Kaspa[®]

Kaspa[®] is a semi-leafless, late-flowering variety with resistance to shattering, good early-season vigour and moderate resistance to lodging. Kaspa[®] is susceptible to Powdery mildew, Black spot and the 'Kaspa[®] strain' of downy mildew. The seed of Kaspa[®] is distinct from traditional dun types (such as Parafield) in that it is red-brown in colour and almost spherical in shape. Kaspa[®] needs to be considered carefully before use as an option in low-rainfall areas or areas prone to early periods of high temperature and drought stress due to its late and condensed flowering period. Kaspa[®] also should be considered carefully in areas prone to frequent severe vegetative frosts due to potential for yield loss to Bacterial blight. Kaspa[®] is under contract to Seednet.

Traditional dimpled dun seed type

PBA Oura[®]

PBA Oura[®] is a high-yielding early to mid-flowering semi-dwarf dun variety with high yields and improved resistance (MR-MS) to Bacterial blight (*p.v. syringae*) over Kaspa[®], PBA Gunyah[®], PBA Twilight[®] and PBA Wharton[®]. This line has broad adaptation and high yield potential in short growing seasons. It produces non sugar-type pods and has fair to good lodging resistance at maturity. PBA Oura[®] seed is dimpled and not a 'Kaspa[®] seed type'. PBA Oura[®] has improved resistance (MR-MS) to the 'Kaspa[®] strain of downy mildew and improved tolerance to metribuzin herbicide over Kaspa[®]. Seed is licensed to Seednet.

PBA Percy[®]

PBA Percy[®] is an early-flowering conventional dun variety with improved resistance (MR) to Bacterial blight (*pv syringae*) over all other varieties, making it a preferred option in areas prone to this disease. Its early flowering and early maturity make it well suited to delayed sowing for disease management and the agronomic practice of crop-topping. It is moderately tolerant to salinity and produces non sugar-type pods similar to PBA Oura[®]. PBA Percy[®] seed is dimpled and not a 'Kaspa[®] seed type'. PBA Percy[®] generally produces yields similar to PBA Oura[®] but in low rainfall environments can be the highest yielding dun variety in trials. Seed is licensed to Seednet.

PBA Coogee[®]

PBA Coogee[®] is a mid-flowering and mid-maturing conventional dun pea suitable for either grain or forage production. It has higher grain yield and similar biomass production to Morgan PSE 23[®], and grain yield between Parafield and Kaspa[®]. Flowering and pod set is generally slightly later than both Parafield and Kaspa[®]. PBA Coogee is resistant to Powdery mildew and has improved tolerance to soil boron and salinity compared to other varieties. Seed is licensed to Seednet.

WHITE TYPES

White peas cannot be delivered to bulk export markets with dun peas. Some high-quality specialised white peas may fit into specific premium value markets for split peas. Higher prices may be achieved if supplying specific niche markets, but these markets may be small. Small-seeded white peas are likely to only suit domestic stock feed markets. Growers are advised to secure markets before deciding to grow these pea types.

PBA Pearl[®]

PBA Pearl[®] is a semi-leafless white pea variety which is broadly adapted and the highest yielding field pea in long-term evaluation trials in all areas of SA. It has an erect growth habit, often with excellent lodging resistance at maturity. It is early to mid flowering and produces non sugar-type pods similar to PBA Oura[®]. It has a favourable disease-resistance profile, with good resistance to bean leaf roll virus, and moderate susceptibility to Bacterial blight. Seed is available through Seednet and growers are advised to secure markets before deciding to grow white peas as they cannot be delivered to bulk dun or Kaspa[®] type export markets.

**BLUE TYPES
(GREEN COTYLEDONS)**

Some blue pea varieties are for specific premium value markets, which are usually only small. Quality is paramount in these markets used predominantly for canning and snack food. Important parameters include damage by insects, bleaching of seed coat and consistency of seed colour.

Two blue field pea varieties, Excell and Maki, have been available to growers in the past. Maki is best suited to the north-eastern field pea growing areas of northern Australia, and limited testing has occurred in southern Australia. Both varieties are outclassed for yield and agronomic adaptation by the newer dun and white pea releases in the southern region of Australia and they have a relatively poor disease-resistance profile, as shown in Table 2.

NOTES

NOTES



NVTtools

CANOLA | WHEAT | BARLEY | CHICKPEA | FABA BEAN | FIELD PEA |
LENTIL | LUPIN | OAT | SORGHUM

Long Term Yield Reporter

New web-based high speed Yield Reporting tool, easy-to-use means of accessing and interpreting the NVT Long Term MET (Multi Environment Trial) results.



Crop Disease Au App



Access to current disease resistance ratings & disease information.

Long Term Yield App



Easy access to the analysed NVT Multi Environment Trial (MET) data.