SOUTHERN
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GRDC GROWNOTES™

GRDC GRAINS RESEARCH & DEVELOPMENT CORPORATION

FIELD PEA

SECTION 3

PRE-PLANTING

KEY POINTS | EVALUATION OF YIELD POTENTIAL | SELECTING A VARIETY | FIELD PEA VARIETIES | PLANTING SEED QUALITY | SEED TESTING | SAFE RATES OF FERTILISER SOWN WITH THE SEED

Pre-planting

Key points

- **When selecting a variety, consider seed type (white, dun, blue), marketability, seed size with reference to sowing or cleaning machinery, varietal maturity and sowing date, disease resistance, standing ability, seed-shattering resistance, ease of harvest, yield in your region, market outlets and seed availability.**
- **Good quality, undamaged seed is essential to ensure the best start for the crop. Use seed with greater than 80% germination.**
- **Testing of seed for germination and disease is highly desirable.**

When a paddock is to be sown to a pulse crop, broadleaf weed pressure should be low and the weed seedbank should have been reduced in previous crops. Avoid problem-weed paddocks, considering both weeds that are difficult to control and weeds which may contaminate the grain sample.

Herbicide history must also be considered and paddock records reviewed. Residues of Group B herbicides that have been applied in the previous crop can be very damaging to following pulse crops including field pea, particularly in alkaline soils after extended dry periods. Examples of these products include sulfonylurea herbicides, such as chlorsulfuron (e.g. Glean®) and metsulfuron methyl (e.g. Ally®), as well as metosulam (Eclipse®), triasulfuron (Logran®) and imazapic + imazapyr (OnDuty®).

Common spikes used in pre-plant knockdown sprays (e.g. 2,4-D products and dicamba) have plant-back restrictions. These range from 7–21 days, depending upon product and rate. When applied to dry soil, at least 15 mm of rainfall is required prior to the commencement of the plant-back period. Always consult the product label and follow the recommended plant-back periods.[1]

3.1 Evaluation of yield potential

Productivity of the grains industry depends on the continued adoption and deployment of new technologies, including the adoption of new varieties with superior yield and useful disease resistance. When considering a new variety, growers should compare the grain yield, grain quality and disease resistances of the new variety with currently grown varieties.[2] (See Section 1.1 Field pea types for more information.)

The most accurate predictor of a variety's performance is a stable yield in many locations over several years. Yield results are available from the National Variety Trials (NVT) website (http://www.nvtonline.com.au), as well as from specific Pulse Variety Management Package (VMP) brochure (https://grdc.com.au/research/trials,-programs-and-initiatives/pba/link3.aspx).[3]

Individual NVT trial results provide only a snapshot in time and may lead to an unsuitable varietal choice. Combining data across trials (and years), using a current long-term analysis based on geographic region, enhances the chance of selecting appropriate varieties. A new method of analysis forms environment groups from 'similar' trials rather than geographic regions and will provide the most accurate prediction of relative yield performance of varieties for an environment.[4]

1 Northern Region Field Pea Management Guide (2010). Pulse Australia, http://sydney.edu.au/agriculture/documents/pbi/pbi_region_north_field_pea_management_guide.pdf

2 NVT (2013) Queensland 2013 wheat varieties. GRDC/Queensland Department of Agriculture and Fisheries, https://grdc.com.au/NVT-QLD-WheatVarietyGuide

3 G Cumming (2014) Chickpea varieties selecting horses for courses. GRDC Update Papers 5 March 2014, https://grdc.com.au/Research-and-Development/GRDC-Update-Papers/2014/03/Chickpea-varieties-selecting-horses-for-courses

4 A Kelly, A Smith, B Cullis (2013) Which variety should I grow? New statistical methods for NVT allow for better decision making. GRDC Update Papers, 12 March 2013, https://grdc.com.au/Research-and-Development/GRDC-Update-Papers/2013/03/Kelly-Alison-What-should-I-grow

NVT long-term-yield report

As examples, Table 1 shows the long-term (2011–15) NVT results for field pea in South Australia's Mid North region and Figure 1 shows the long-term (2011–15) NVT results for field pea in the Victorian Mallee.

Table 1: Field pea variety trials example – Mid North, South Australia.

Variety	Predicted average yield (t/ha)	Total number of trials
PBA Pearl$^{\phi}$	2.221	32
PBA Wharton$^{\phi}$	2.167	32
PBA Oura$^{\phi}$	2.098	32
Yarrum	2.088	8
Sturt	2.084	15
PBA Gunyah$^{\phi}$	2.069	29
PBA Percy$^{\phi}$	2.053	25
PBA Twilight$^{\phi}$	2.043	29
Kaspa$^{\phi}$	1.993	32
Morgan$^{\phi}$	1.901	3
Excell	1.889	3
Parafield	1.804	20

Source: http://www.nvtonline.com.au/nvt-results-reports/?nocollapseomatic=1#filterYear=2015&filterCrop=fp&filterSubcrop=&postcode=3551

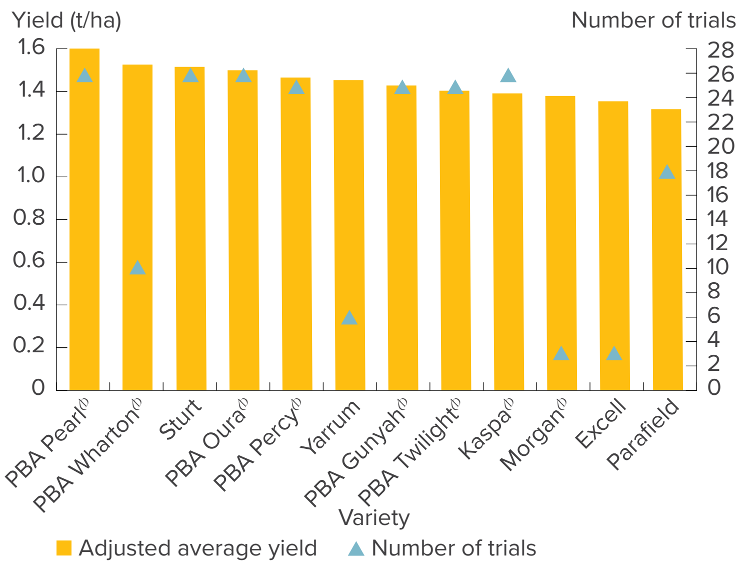


Figure 1: *Field pea yield responses, 2011–15, Mallee, Victoria.*

Source: http://www.nvtonline.com.au/nvt-results-reports/?nocollapseomatic=1#filterYear=2015&filterCrop=fp&filterSubcrop=&postcode=3551

PBA and NVT

Pulse Breeding Australia (PBA) and its commercial seed partners launch new varieties at targeted pulse field days during the spring field days. This gives growers and advisers the opportunity to view and assess the varieties in their growing regions prior to their availability.

A Variety Management Package (VMP) is released with each new PBA variety (http://www.seednet.com.au/pulses-101.html). These brochures provide information about appropriate agronomic and disease management, and disease ratings for each variety. The information in the brochures is compiled from agronomic and disease management projects with investment from the Grains Research and Development Corporation (GRDC) in conjunction with the PBA partner agencies, combined with yield data from variety trials conducted by both PBA and NVT.

MORE INFORMATION

More information on PBA varieties and brochures
https://grdc.com.au/Research-and-Development/Major-Initiatives/PBA/PBA-Varieties-and-Brochures

3.2 Selecting a variety

When choosing a field pea variety a number of factors need to be considered:

- What market am I aiming for – human consumption or stockfeed?
- What am I producing field pea for – grain, hay, green/brown manure?
- What disease traits are required?
- What is my sowing date?
- Harvesting equipment – can I handle a variety that falls over or does it need to be erect at harvest?

To achieve maximum returns, best agronomic practice needs to be employed according to the variety. These practices include careful paddock selection, planting of high quality seed and suitable crop protection measures, including weed, disease and insect management, followed by careful harvest, handling and storage practices.

Consideration of market access and options, even prior to crop establishment, can also have a significant impact on the crop's value and profitability.[5]

When selecting a variety consider seed type (white, dun, blue), seed size with reference to sowing or cleaning machinery, varietal maturity and sowing date, disease resistance, standing ability, seed-shattering resistance, ease of harvest, yield in your region, market outlets and seed availability. A large number of varieties are available, with a wide range of characteristics; some are only suited to specific growing regions.[6] Improved tolerance to salinity and boron has also been important in variety selection for some areas (e.g. PBA Wharton⁽ᶲ⁾).[7]

MORE INFORMATION

Online Farm Trials
http://www.farmtrials.com.au

Trials conducted at Westmere in 2011 and 2012 investigated the adaptability of a range of field pea varieties to varying sowing dates, crop-topping and disease control. (See Section 10.2.1 Field trial.)

3.2.1 Characteristics of field pea varieties for southern Australia

Agronomic characteristics

For detailed information on varieties available in Victoria in 2017 (Table 2) visit Agriculture Victoria's Victorian winter crop summary (https://grdc.com.au/resources-and-publications/all-publications/publications/2017/03/nvt-victorian-winter-crop-summary).

5 G Cumming (2014) Chickpea varieties selecting horses for courses. GRDC Update Papers, 5 March 2014, https://grdc.com.au/Research-and-Development/GRDC-Update-Papers/2014/03/Chickpea-varieties-selecting-horses-for-courses

6 P Matthews, D McCaffery, L Jenkins (2017) Winter crop variety sowing guide, Department of Primary Industries, NSW, https://www.dpi.nsw.gov.au/about-us/media-centre/releases/2017/2017-winter-crop-variety-sowing-guide-now-available

7 Pulse Breeding Australia (2015) PBA Wharton⁽ᶲ⁾ variety management package, http://www.pulseaus.com.au/storage/app/media/crops/2013_VMP-Kfieldpea-PBAWharton.pdf

For detailed information on varieties available in SA in 2017 see SARDI's *Field pea variety sowing guide 2017* (http://www.nvtonline.com.au/wp-content/uploads/2017/01/SA-sowing-guide-2017_lo-res.pdf).

Table 2: Agronomic characteristics of field pea varieties.[8]

Variety	Seed size	Plant habit	Plant vigour, early season	Flowering time	Flowering colour	Maturity time	Plant lodging resistance at maturity	Pod shattering at maturity	Boron tolerance	Salinity tolerance
Yellow or blue pea grain type										
Excell	Me	SD-SL	high	early		early-mid	good	S:NSP	S	S
PBA Hayman(b)	Sm	C (multi-branched)	Low-Med	very late	white	very late	poor	MR:NSP	MS	MS
PBA Pearl(b)	Me-Lg	SD-SL	moderate	early-mid	white	early-mid	good	MR:NSP	MS	MS
Sturt	M-Sm	C	high	early-mid	white	mid	poor	MR:NSP	S	MS
Kaspa grain type										
Kaspa(b)	Me	SD-SL	moderate	late	pink	mid	fair-good	R:SP	S	S
OZP1101		SD-SL	high	mid-late		mid	good	R:SP	S	S
PBA Gunyah(b)	Me	SD-SL	high	early-mid	pink	early	fair-good	R:SP	S	SMS
PBA Twilight(b)	Me	SD-SL	high	early	pink	early	fair-good	R:SP	S	S
PBA Wharton(b)	Me	SD-SL	moderate	early-mid	pink	early	fair-good	R:SP	MT	MT
Australian dun grain type										
Morgan(b)	Sm	Tall-SL	high	late	purple	late	poor-fair	MR:NSP	S	S
Parafield	Me-Lg	C	high	mid	purple	mid	poor	MR:NSP	S	MS
PBA Coogee(b)	Lg	C	high	mid-late	purple	mid	poor	MR:NSP	T	MT
PBA Oura(b)	Me	SD-SL	moderate	early-mid	purple	early	fair-good	MR:NSP	MS	S
PBA Percy(b)	Me-Lg	C	high	early	purple	early	poor	MR:NSP	S	MT

Sm = small, Me = medium, Lg = large, SD = semi-dwarf, C = conventional, SL = semi-leafless, S = susceptible, MS = moderately susceptible, MR = moderately resistant, R = resistant, SP = sugar pod type pod, NSP = non sugar pod type, I = intolerant, MT = moderately intolerant

Source: J Couchman, K Hollaway (2016) NVT Victorian Winter Crop Summary 2017. Department of Economic Development, Jobs, Transport and Resources, www.grdc.com.au/NVT-Victorian-Winter-Crop-Summary

Disease resistance characteristics

When choosing varieties, it is essential to consider their disease susceptibility (Table 3), along with yield potential, price potential, marketing opportunities, maturity timing, lodging resistance and other agronomic features relevant to a growing region.

Varietal resistance to bacterial blight and black spot is extremely important. These diseases are potential problems for field pea in tight rotations, in higher-rainfall areas or wetter years.

(Note that fungicides are rarely economic and do not control bacterial blight.) Improvements in varietal resistance offer the best long-term prospects for control of these diseases. For more information on disease management see Section 9 Diseases and Section 10 Pre-harvest treatments.

8 J Couchman, K Hollaway (2016) NVT Victorian Winter Crop Summary 2017. Department of Economic Development, Jobs, Transport and Resources, www.grdc.com.au/NVT-Victorian-Winter-Crop-Summary

When comparing yields between varieties, it is important to note that under bacterial blight pressure or high moisture stress, varieties with greater susceptibility are more likely to suffer greater yield losses than less susceptible varieties.[9]

Table 3: Disease resistance characteristics of field pea varieties.[10]

Variety	Blackspot (Ascochyta)	Bacterial blight (field rating)	Downy mildew (Kaspa strain)	Downy mildew (Parafield strain)	Powdery mildew	PSbMV virus	BLRV virus (field rating)	*Pratylenchus neglectus*	*Pratylenchus thornei*
Yellow or blue pea grain type									
Excell	MS	S	S	MR	S	-	-	-	-
PBA HaymanΦ	Sp	MRp	-	RMR	R	-	-	-	-
PBA PearlΦ	MS	MS	S	R	S	S	R	MR-MS	MR-MS
Sturt	MS	MS	S	MS	S	S	MS	MSp	MR
Kaspa grain type									
KaspaΦ	MS	S	S	MR	S	S	S	MR-MS	MR-MS
OZP1101	MS	MRMSp	MS	R	S	S	S	MR-MS	MR-MS
PBA GunyahΦ	MS	S	S	R	S	S	S	MR	MR-MS
PBA TwilightΦ	MS	S	S	R	S	S	S	MRMSp	MR-MS
PBA WhartonΦ	MS	S	S	MS	R	R	R	MRMSp	MRp
Australian dun grain type									
MorganΦ	MS	MS	S	MR	S	S	Sp	RMRp	MRp
Parafield	MS	MS	S	S	S	S	S	MR-MS	MRp
PBA CoogeeΦ	S	MRMSp		Sp	R	-	Sp	MRMSp	MRMSp
PBA OuraΦ	MRMSp	MRMS	MR-MS	MR	S	S	MR	MRMSp	MRMSp
PBA PercyΦ	MS	MR	S	S	S	S	S	MR-MS	RMRp

PBSV = Pea seed-borne mosaic virus, BLRV = Bean leaf roll virus
Resistance order from best to worst: R > RMR > MR > MR-MS > MS > MSS > S > SVS > VS
p = provisional ratings – treat with caution R = resistant, M = moderately, S = susceptible, V = very

Source: J Couchman, K Hollaway (2016) NVT Victorian Winter Crop Summary 2016. Department of Economic Development, Jobs, Transport and Resources, http://agriculture.vic.gov.au/agriculture/grains-and-other-crops/crop-production/victorian-winter-crseed sixeop-summary

Field pea variety response to herbicides

For information on field pea variety responses to herbicides see *Pulse variety response in South Australia* (http://www.nvtonline.com.au/wp-content/uploads/2016/04/SA-Pulses-2015.pdf) (Table 4) and Pulse variety response to herbicides in Victoria (http://www.nvtonline.com.au/wp-content/uploads/2013/03/Herbicide-Tolerance-VIC-Pulses-2003-2005.pdf) (Table 5).

9 W Hawthorne and W Beggood (2007). Field peas in South Australia and Victoria. Pulse Australia Fact sheet

10 J Couchman, K Hollaway (2016) NVT Victorian Winter Crop Summary 2016. Department of Economic Development, Jobs, Transport and Resources, www.grdc.com.au/NVT-Victorian-Winter-Crop-Summary

FEEDBACK

Table 4: Field pea variety responses to herbicide, South Australia.

Herbicide		Broadstrike®	Brodal Options® + MCPA Amine	Boxer Gold®	Diuron	Lexone®	Lexone®	Lexone®*	MCPA Sodium
		Flumetsulam	Diflufenican + MCPA Amine	Prosulfocarb + S-metolochlor	Diuron	Metribuzin	Metribuzin	Metribuzin	MCPA Sodium
Variety	**Years tested**	**1994–2015**	**1994–2015**	**2015**	**2011–2014**	**1994–2010**	**1994–2015**	**2005–2008**	**1994–2008**
Bundi	2006–2007	√(2)	√(2)	-	-	√(2)	√(2)	√(2)	√(2)
Kaspa^(PBR)	2002–2012	N(1/11)	11(1/11)	-	N(1/2)	N(2/9)	N(4/11)	9(1/4)	10(1/7)
PBA Gunyah^(PBR)	20008–2015	N(1/8)	√(8)	√(1)	√(4)	9(1/3)	N(3/8)	√(1)	√(1)
PBA Oura^(PBR)	2011–2013	√(3)	√(3)	-	√(3)	-	√(3)	-	-
PBA Twilight^(PBR)	2008–2011	N(1/4)	N(1/4)	-	√(1)	N(1/3)	13(1/4)	16(1/1)	√(1)
OZP1101	2012–2015	N(1/4)	14(1/4)	√(1)	√(3)	-	√(4)	-	-
Parafield	1996–2005	11–13(2/10)	√(10)	-	-	N(3/10)	N(5/10)	√(1)	5–20 (2/10)
PBA Percy^(PBR)	2014–2015	13(1/2)	√(2)	√(1)	√(1)	-	√(2)	-	-
PBA Pearl^(PBR)	2012–2013	√(2)	√(2)	-	√(2)	-	√(2)	-	-
Sturt	2002–2005	10–13(2/4)	√(4)	-	-	8(1/4)	12–17(2/4)	10(1/1)	√(4)
SW Celine	2006–2007	√(2)	√(2)	-	-	√(2)	√(2)	N(1/2)	√(2)
PBA Wharton^(PBR)	2012–2015	√(3)	√(3)	√(1)	√(2)	-	√(3)	-	-
Rates (product/ha)		25 g	125 mL + 80 mL	2.5 L	1 k	280 g	280 g	280 g	900 mL
Crop stage at spraying		5 node	5 node	IBS	PSPE	PSPE	3 node	6 node	5 node

*Denotes off-label use. This use is not endorsed by this data and no responsibility taken for its interpretation. IBS (incorporation by sowing); PSPE (post-sowing pre-emergent).

Source: Pulse variety response in South Australia, http://www.nvtonline.com.au/wp-content/uploads/2016/04/SA-Pulses-2015.pdf

The sensitivity of the variety is summarised, using the following symbols based on the yield responses across all trials.

- Not tested or insufficient data.

√ (z) no significant yield reductions at recommended rates or higher than recommended rates in (z) trials.

N (w/z) narrow margin, significant yield reductions at higher than recommended rate, but not at recommended rate, significant event occurring w years out of z years tested. Eg (2/5) = tested for 5 years, 2 returning significant yield loss.

x% (w/z) yield reduction (warning) significant yield reduction at recommended rate in 1 trial only in z years of testing.

x-y% (w/z) yield reductions (warning) significant yield reductions at recommended rate in w years out of z years tested.

Always follow label recommendations. All pesticide applications must accord with the currently registered label for that particular pesticide, crop, pest and region. Any research regarding pesticides of their use reported in this publication does not constitute a recommendation for that particular use by the authors, the author's organisations or GRDC. It must be emphasized that crop tolerance and yield responses to herbicides are strongly influenced by seasonal conditions.

Table continued on next page.

Herbicide		Outlook*	Simazine	Simazine + Diuron	Spinnaker®	Sakura®	Status®*	Raptor®	Terbyne®
Herbicide		Di-Methe-namid-P	Simazine	Simazine + Diuron	Imathe-thapyr	Pyroxa-sulfone	Cleth-odim	Imaz-amox	Teruth-ylazine
Variety	Years tested	2011–2013	2011–2015	1994–2010	1994–2010	2015	2014	1994–2015	2009–2015
Bundi	2006–2007	-	-	√(2)	15(1/2)	-	-	N(2/2)	-
Kaspa⛔	2002–2012	√(2)	N(1/2)	N(1/8)	√(9)	-	-	√(10)	N(1/4)
PBA Gunyah⛔	20008–2015	√(3)	14(1/5)	9–11(2/3)	N(1/3)	√(1)	√(1)	11(1/8)	9(1/7)
PBA Oura⛔	2011–2013	N(1/3)	√(3)	-	-	-	-	√(3)	√(3)
PBA Twilight⛔	2008–2011	√(1)	√(1)	9(1/3)	11(1/3)	-	-	√(4)	N(2/3)
OZP1101	2012–2015	√(2)	16(1/4)	-	-	√(1)	√(1)	N(1/4)	N(1/4)
Parafield	1996–2005	-	-	29(1/10)	11–15(2/10)	-	√(1)	7(1/10)	-
PBA Percy⛔	2014–2015	-	√(2)	-	-	√(1)	√(1)	√(2)	N(1/2)
PBA Pearl⛔	2012–2013	√(2)	15(1/2)	-	-	-	-	N(1/2)	N(1/2)
Sturt	2002–2005	-	-	√(4)	7(1/4)	-	-	N(1/4)	-
SW Celine	2006–2007	-	-	√(2)	√(2)	-	-	N(1/2)	-
PBA Wharton⛔	2012–2015	√(1)	√(3)	-	-	√(1)	√(1)	√(3)	√(3)
Rates (product/ha)		1 L	1 kg	350 mL + 650 mL	70 g	118 g	1 L	45 g	1 kg
Crop stage at spraying		IBS	PSPE	PSPE	3 node	IBS	3 node	3 node	PSPE

*Denotes off-label use. This use is not endorsed by this data and no responsibility taken for its interpretation. IBS (incorporation by sowing); PSPE (post-sowing pre-emergent).

Source: Pulse variety response in South Australia, http://www.nvtonline.com.au/wp-content/uploads/2016/04/SA-Pulses-2015.pdf

The sensitivity of the variety is summarised, using the following symbols based on the yield responses across all trials.

- Not tested or insufficient data.

√ (z) no significant yield reductions at recommended rates or higher than recommended rates in (z) trials.

N (w/z) narrow margin, significant yield reductions at higher than recommended rate, but not at recommended rate, significant event occurring w years out of z years tested. Eg (2/5) = tested for 5 years, 2 returning significant yield loss.

x% (w/z) yield reduction (warning) significant yield reduction at recommended rate in 1 trial only in z years of testing.

x-y% (w/z) yield reductions (warning) significant yield reductions at recommended rate in w years out of z years tested.

Always follow label recommendations. All pesticide applications must accord with the currently registered label for that particular pesticide, crop, pest and region. Any research regarding pesticides of their use reported in this publication does not constitute a recommendation for that particular use by the authors, the author's organisations or GRDC. It must be emphasized that crop tolerance and yield responses to herbicides are strongly influenced by seasonal conditions.

Table 5: Field pea variety responses to herbicide, Victoria.

Herbicide			Trifluralin	Spinnaker® 240/700	Lexone®	Diuron 500/900	Raptor®	Brodel®	Brodel® + MCPA
			trifluralin	imazethapyr	metri-buzin	diuron	imamox	difufen-ican	difufen-ican + MCPA
Variety	**Years tested**		2003–04	2003–04	2003–04	2003–04	2003–04	2003	2004
		Site	AB	AB	AB	AB	AB	A	B
Dundale	2004	A	-	-	-	-	-	-	-
Kaspa⁽ᵈ⁾	2003–04	AB	✓	✓	✓	✓	✓	✓	✓
Parafield	2004	A	-	-	-	-	-	-	-
Snowpeak	2004	A	-	-	-	-	-	-	-
Moonlight	2004	B	-	N	-	-	-	-	-
Sturt	2003–04	AB	✓	N	✓	✓	✓	✓	✓
Rates (ai/ha)			576-720 g	48-70 5	210 g	600-756 g	31.5	75 g	75 g + 75 g
Rates (product/ha)			1200–1500 mL	200(240)-100(700)	280 (Lex) 435 (Sen)	1200 (500) - 850 (900)	45g	150ml	150ml + 150ml
Crop stage at spraying			IBS	PSPE	PSPE	PSPE	3-4 node	3-4 node	3-4 node

Herbicide			Broadstrike®	Verdict®	Select®
			Flumet-salum	Haloxyfop	Clethodim
Variety	**Years tested**		2003–04	2003–04	2004
		Site	AB	AB	AB
Dundale	2004	A	-	-	-
Kaspa⁽ᵈ⁾	2003–04	AB	✓	✓	✓
Parafield	2004	A	-	-	-
Snowpeak	2004	A	-	-	-
Moonlight	2004	B	-	-	-
Sturt	2003–04	AB	✓	✓	✓
Rates (ai/ha)			20 g	52 g	96 g
Rates (product/ha)			25 g	75 ml	400 ml
Crop stage at spraying			3–4 node	z14 grass weeds	z14 grass weeds

IBS (incorporation by sowing); PSPE (post-sowing pre-emergent).
Source: http://www.nvtonline.com.au/wp-content/uploads/2013/03/Herbicide-Tolerance-VIC-Pulses-2003-2005.pdf

The sensitivity of the variety is summarised, using the following symbols based on the yield responses across all trials.

- Not tested or insufficient data.

✓ no significant yield reductions at recommended rates or higher than recommended rates in 2 trials.

N (narrow margin) significant yield reductions at higher rate than recommended in 1+ trial but not at recommended rate.

x% yield reduction (warning) significant yield reduction at recommended rate in 1 trial only.

x-y% yield reductions (warning) significant yield reductions at recommended rate in 2+ trials.

Always follow label recommendations. All pesticide applications must accord with the currently registered label for that particular pesticide, crop, pest and region. Any research regarding pesticides of their use reported in this publication does not constitute a recommendation for that particular use by the authors, the author's organisations or GRDC. It must be emphasized that crop tolerance and yield responses to herbicides are strongly influenced by seasonal conditions.

MORE INFORMATION

Please see http://www.pulseaus.com.au/storage/app/media/crops/pulses/2016_Pulse-Variety-Charts-web.pdf for more details and images of pulse varieties

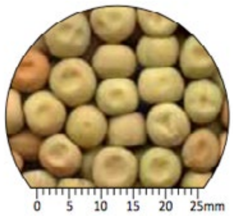
3.3 Field pea varieties

$^{\phi}$ denotes Plant Breeders Rights apply

3.3.1 Dun types (dimpled)

PBA Coogee$^{\phi}$

http://www.seednet.com.au/documents/PBA%20Coogee%202016.pdf



PBA Coogee$^{\phi}$

Released: 2013
Seed weight: 22–27 g/100
Coat colour: brown-green
Production region: North

PBA Coogee$^{\phi}$ 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$^{\phi}$, and grain yield between Parafield and Kaspa$^{\phi}$. Flowering and podset are generally slightly later than both Parafield and Kaspa$^{\phi}$. PBA Coogee$^{\phi}$ is resistant to powdery mildew and has improved tolerance to soil boron and salinity compared to other varieties. Seed is licensed to Seednet.

PBA Oura$^{\phi}$

http://www.seednet.com.au/documents/PBAOura2012.pdf

PBA Oura$^{\phi}$

Released: 2011
Seed weight: 18–25 g/100
Coat colour: brown-green
Production region: South and North

PBA Oura$^{\phi}$ is a high-yielding, early to mid flowering, semi-dwarf dun variety with high yields and improved resistance (moderately resistant/moderately susceptible (MR-MS)) to bacterial blight (*pv. syringae*) over Kaspa$^{\phi}$, PBA Gunyah$^{\phi}$, PBA Twilight$^{\phi}$ and PBA Wharton$^{\phi}$. This line has broad adaptation and high yield potential in short growing seasons. It produces non-sugar-type pods, but is not prone to shattering and has fair to good lodging resistance. PBA Oura$^{\phi}$ has improved resistance (MR-MS) to the Kaspa$^{\phi}$ strain of downy mildew and improved tolerance to metribuzin herbicide over Kaspa$^{\phi}$. Seed is licensed to Seednet.

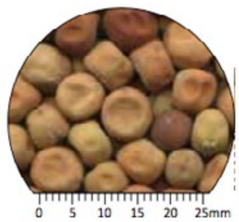
PBA Percy$^{\phi}$

http://www.seednet.com.au/documents/PBAPercyWeb.pdf

PBA Percy$^{\phi}$
Released: 2011
Seed weight: 20–26 g/100
Coat colour: brown-green
Production region: South and North

PBA Percy$^{\phi}$ is an early-flowering conventional dun variety with improved resistance (MR) to bacterial blight (*pv. syringae*) over all other varieties, making it a good option in areas prone to this disease. Its early flowering and early maturity make it well suited to delayed sowing for disease management and crop-topping. It produces non-sugar-type pods, but is not prone to shattering (similar to PBA Oura$^{\phi}$). PBA Percy$^{\phi}$ generally produces yields similar to PBA Oura$^{\phi}$ but in low-rainfall environments can be the highest yielding dun variety in trials. Seed is licensed to Seednet.

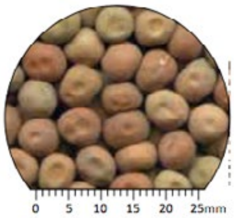
Parafield



Parafield
Released: 1999
Seed weight: 21–27 g/100
Coat colour: brown-green
Production region: South

Parafield is a traditional Australian dun field pea that is tall, mid to late-season flowering, and produces large, Australian dun-type grain. Parafield has a lower yield potential compared to recent variety releases. PBA Percy$^{\phi}$ is now a superior option for growers wanting to grow a conventional dun field pea. Parafield will need to be managed for all diseases in disease-prone areas. Parafield has poor lodging resistance and will require specialised pea pick-up fronts for harvesting. It has moderate non-sugar-pod resistance to shattering. Released in 1998, it can be freely marketed because it is no longer protected by PBR. Parafield has no commercialised partners.

Morgan$^{\text{(b}}$



Morgan$^{\text{(b}}$

Released: 1998
Seed weight: 16–22 g/100
Coat colour: brown-green
Production region: South

A tall, late-flowering, semi-leafless pea, Morgan$^{\text{(b}}$ produces small, Australian dun-type grain. Morgan$^{\text{(b}}$ has lower grain yield potential than other varieties, but was released for the lower-rainfall regions of central and western NSW as a dual-purpose pea that could be used for forage in drought years. Morgan$^{\text{(b}}$ is MR to downy mildew (Parafield strain). Morgan$^{\text{(b}}$ will need to be managed for blackspot, bacterial blight, PSbMV, powdery mildew, downy mildew (Kaspa$^{\text{(b}}$ strain) and BLRV in disease-prone areas. Pods are susceptible to pod shattering. Its grain size is small and less suitable for human consumption markets. It was commercialised by Hart Bros Seeds.

Yarrum

http://www.pulseaus.com.au/storage/app/media/crops/2011_VMP-Dunfieldpea-Yarrum.pdf

Yarrum

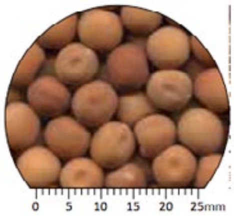
Released: 2004
Seed weight: 20–26 g/100
Coat colour: brown-green
Production region: North

Yarrum is a semi-dwarf, semi-leafless dun type that has an erect habit during early growth, but can lodge at maturity when high yielding or weather conditions are unfavourable. It has mid maturity and will often commence flowering slightly earlier than Parafield, but maturation date is similar. Yarrum has shown widespread adaption and high yield potential across a range of environments, but its best relative long-term advantage is in the medium to higher-rainfall southern regions, where its powdery mildew and PSbMV resistance may be beneficial. Seed is licensed to Australian Grain Technologies.

3.3.2 Kaspa-type grain (rounded dun)

Kaspa$^{\phi}$

http://www.pulseaus.com.au/storage/app/media/crops/2011_VMP-dunfieldpea-Kaspa.pdf



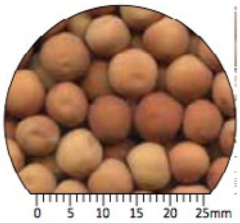
Kaspa$^{\phi}$

Released: 2002
Seed weight: 20–26 g/100
Coat colour: pale brown
Production region: South and West

Kaspa$^{\phi}$ is semi-leafless, late-flowering field pea that is resistant to shattering and has good early season vigour and moderate resistance to lodging. Kaspa$^{\phi}$ is susceptible to powdery mildew and blackspot and the Kaspa strain of downy mildew. The seed of Kaspa$^{\phi}$ is distinct from traditional dun types (e.g. Parafield) in that it is red-brown in colour and almost spherical in shape. Kaspa$^{\phi}$ is high yielding in many areas of southern Australia. However, it 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$^{\phi}$ should also be considered carefully in areas prone to frequent severe vegetative frosts due to potential for yield loss to bacterial blight. Kaspa$^{\phi}$ is under contract to Seednet.

PBA Gunyah$^{\phi}$

http://www.seednet.com.au/documents/PBA_Gunyah__field_pea.pdf



PBA Gunyah$^{\phi}$

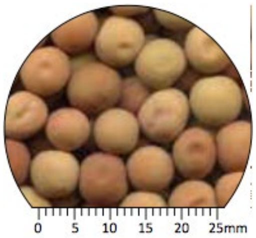
Released: 2010
Seed weight: 20–26 g/100
Coat colour: pale brown
Production region: South and West

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

FEEDBACK

PBA Twilight$^{\Phi}$

http://www.seednet.com.au/documents/PBA_Twilight__field_pea.pdf



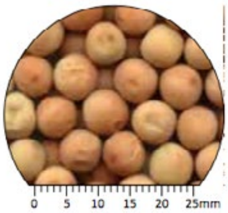
PBA Twilight$^{\Phi}$

Released: 2010
Seed weight: 20–26 g/100
Coat colour: pale brown
Production region: South and West

PBA Twilight$^{\Phi}$ is a Kaspa-type with similar attributes to PBA Gunyah$^{\Phi}$. It has a shorter flowering period and is earlier in maturity than PBA Gunyah$^{\Phi}$ 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$^{\Phi}$ when yield potential is below 1.75 t/ha, and higher than PBA Gunyah$^{\Phi}$ when yield potential is below 1.25 t/ha. Its disease resistance profile is similar to Kaspa$^{\Phi}$ and therefore not well suited to bacterial-blight-prone environments. Despite being susceptible to powdery mildew it is likely that PBA Twilight$^{\Phi}$ will incur less yield loss from this disease than Kaspa$^{\Phi}$ due to its earlier maturity. PBA Twilight$^{\Phi}$ is licensed to Seednet.

PBA Wharton$^{\Phi}$

http://www.seednet.com.au/documents/PBAWhartonFactsheet.pdf



PBA Wharton$^{\Phi}$

Released: 2013
Seed weight: 20–26 g/100
Coat colour: pale brown
Production region: South, West and North

PBA Wharton$^{\Phi}$ is a Kaspa-type dun pea offering improved powdery mildew and virus resistances (Bean leaf roll virus and Pea seed-borne mosaic virus). It provides the same agronomic benefits as Kaspa$^{\Phi}$ (e.g. lodging and shattering resistance), and will provide a reliable alternative in those areas where powdery mildew and viruses are regular problems. PBA Wharton$^{\Phi}$ is early to mid-flowering and early maturing, making it well suited to the practices of crop-topping and delayed sowing for blackspot management. It is particularly well suited to the Victorian Mallee where it is high-yielding long term. Seed is licensed to Seednet.

FEEDBACK

3.3.3 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 stockfeed markets. Growers are advised to secure markets before deciding to grow these pea types.

PBA Pearl$^{(\phi)}$

http://www.seednet.com.au/documents/PBAPearlFinal.pdf

PBA Pearl$^{(\phi)}$

Released: 2012
Seed weight: 20–26 g/100
Coat colour: white
Production region: South, West and North

PBA Pearl$^{(\phi)}$ is a semi-leafless white pea variety, which is broadly adapted and has had high yields in evaluation trials in all districts. It has an erect growth habit, with excellent lodging resistance at maturity. It is early to mid-flowering and produces non-sugar-type pods but is not prone to shattering (similar to PBA Oura$^{(\phi)}$). 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.

Sturt

http://www.pulseaus.com.au/storage/app/media/crops/2008_VMP-Wfieldpea-Sturt.pdf

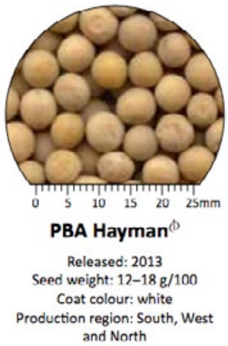
Sturt

Released: 2006
Seed weight: 17–24 g/100
Coat colour: white
Production region: South and North

Sturt is a conventional-leaf-type, small-seeded white pea similar to Parafield in height, lodging resistance and disease susceptibility. Flowering and maturity time of Sturt are similar but generally slightly earlier than Parafield. It consistently yields higher than all other varieties in trials affected by reproductive frosts, indicating some level of tolerance to this stress. Sturt is more sensitive than Kaspa$^{(\phi)}$ and Parafield to label rates of both post-sowing pre-emergent and post-emergent applications of metribuzin on alkaline soils in SA. Sturt is licensed to Premier Seeds.

PBA Hayman$^{\phi}$

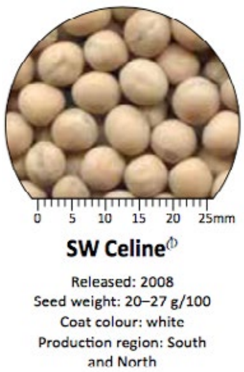
http://www.seednet.com.au/documents/PBA_Hayman_Factsheet.pdf



PBA Hayman$^{\phi}$ is a late-flowering and late-maturing conventional pea suitable for forage production as a potential alternative to vetch. It has lower grain yield than Morgan$^{\phi}$ (which has been considered a dual-purpose variety) but has higher biomass production. Due to its low yields (20–80% of Kaspa$^{\phi}$) grain harvesting in dry seasons or low-rainfall districts can be difficult. Flowering and maturity of PBA Hayman$^{\phi}$ is much later than other field pea varieties and peak growth rates and biomass accumulation also occurs much later than other varieties. PBA Hayman$^{\phi}$ is rated R for powdery mildew, MR for bacterial blight (similar to PBA Percy$^{\phi}$), and MR-R for the Parafield downy mildew strain (although its response against the Kaspa downy mildew strain is unknown). It is more susceptible to blackspot than all varieties and this must be considered carefully before growing this variety. Seed is licensed to Seednet.

SW Celine

http://www.nvtonline.com.au/wp-content/uploads/2013/03/Fact-Sheet-Field-Pea-SW-Celine-VMP.pdf



Bred in Sweden, SW Celine is a semi-leafless white pea of medium height with erect growth habit and white flowers. It has good early vigour and is early to commence flowering with a short to medium flowering duration with very early maturity making it suitable for crop-topping in most regions. SW Celine has good lodging resistance at harvest but does not have pod shatter resistance. It produces medium to large size creamy white grain that will be suitable to both human consumption and stockfeed markets. It has shown yield potential across a range of cropping zones in recent trials, but long-term comparisons are limited. SW Celine seed is commercially available from NuSeed.

3.3.4 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, are available to growers. Maki is best suited to the north-eastern field-pea growing areas of northern Australia, and limited testing has been done in southern Australia. Both varieties are outclassed by the newer dun and white pea releases in the southern region of Australia and they have a relatively poor disease resistance.

Excell

Excell is an early to mid-season flowering, semi-dwarf pea that produces medium-sized, spherical, smooth, blue seed suitable for premium human consumption markets. Excell has lower grain yield potential compared to new variety releases and is best suited to medium-rainfall environments of Victoria and southern NSW. Excell is moderately resistant to downy mildew (Parafield strain). Excell will need to be managed for blackspot, bacterial blight, PSbMV and powdery mildew in disease prone areas. Excell has good lodging resistance, although its pods are susceptible to shattering. Released in 1998, it can be freely marketed.[11] [12]

3.3.5 Forage peas

Two varieties (PBA HaymanAΦ and PBA CoogeeAΦ) have been released with suitability for foraging (hay/silage) or green/brown manuring. PBA CoogeeΦ is considered a dual-purpose variety being suitable for grain (traditional dun type) and/or forage.

The southern pulse agronomy program has been assessing the biomass accumulation and grain yields in comparison with current standards, KaspaΦ (the predominant grain yield variety in south-eastern Australia) and MorganΦ (a dual-purpose field pea variety). Results to date show:

- The ideal timing of hay cutting for both maximum biomass production and ease of drying (i.e. before podset) is likely to be approximately 4–7 days after commencement of flowering (i.e. early pod development).
- Varieties with later flowering and podset (e.g. PBA HaymanΦ) are likely to be better suited to hay production as this allows maximum vegetative growth prior to cutting, and extends hay cut timing into better (warmer and quicker) drying conditions.
- PBA CoogeeΦ may not produce more biomass than KaspaΦ or MorganΦ at the early pod stage.
- PBA HaymanΦ will generally produce more biomass at flowering than grain or dual-purpose varieties (due to its later flowering). This variety shows more rapid growth in early spring than other varieties.
- KaspaΦ and PBA CoogeeΦ produce significantly higher grain yield than MorganΦ or PBA HaymanΦ.
- PBA HaymanΦ has shown the lowest yield and lowest harvest index, indicating that grain retrieval may be difficult in low-rainfall areas. However, due to its lower seed weight (averaging 14 grams/100 seeds compared with 20–25 g/100 seeds in other varieties); seed requirements for sowing will be significantly lower than for other varieties.[13]

11 M Lines, L McMurray, P Kennedy (2015) Pea variety sowing guide 2015, South Australian Research Development Institute, http://www.pir.sa.gov.au/__data/assets/pdf_file/0010/237907/peas.pdf

12 J Couchman, K Hollaway (2016) NVT Victorian Winter Crop Summary 2016. Department of Economic Development, Jobs, Transport and Resources, www.grdc.com.au/NVT-Victorian-Winter-Crop-Summary

13 J Brand, M Rodda, P Kennedy, M Lines, L McMurray, J Paull, K Hobson (2014). Pulse varieties and agronomy update (Ballarat). GRDC Update papers, 5 Feb 2014, https://grdc.com.au/resources-and-publications/grdc-update-papers/tab-content/grdc-update-papers/2014/02/pulse-varieties-and-agronomy-update-ballarat

FEEDBACK

Photo 1: *Field pea cut for hay.*

Photo: W Hawthorne, formerly Pulse Australia

3.3.6 Varieties subject to End Point Royalties (EPR) and seed distribution

Table 6: Field pea varieties subject to End Point Royalties (EPR) and seed distribution arrangements.

Registered name	Variety owner	Royalty manager charged with EPR collection	EPR rate $/tonne (GST exclusive)	Seed distribution arrangements 2016	Grower sales permitted
Bundi	DPI (Vic)	Premier Seeds	$5.00	Premier Seeds	No
PBA Coogee⁽ᵇ⁾	DPI (Vic)	SeedNet	$2.60	SeedNet	No
PBA Gunyah⁽ᵇ⁾	DPI (Vic)	SeedNet	$2.50	SeedNet	No
Helena	DPIRD	DPIRD	$1.20	-	Yes
Kaspa⁽ᵇ⁾	DPI (Vic)	SeedNet	$2.00	SeedNet	No
Maki (AP18)	Plant Research NZ	Waratah Seeds	$4.00	Waratah Seeds	No
PBA Oura⁽ᵇ⁾	DPI (Vic)	SeedNet	$2.60	SeedNet	No
PBA Pearl⁽ᵇ⁾	DPI (Vic)	SeedNet	$2.70	SeedNet	No
PBA Percy⁽ᵇ⁾	DPI (Vic)	SeedNet	$2.60	SeedNet	No
SW Celine	SW Seeds	NuSeed	$3.00	NuSeed	No
PBA Twilight⁽ᵇ⁾	DPI (Vic)	SeedNet	$2.50	SeedNet	No
PBA Wharton⁽ᵇ⁾	DPI (Vic)	SeedNet	$2.60	SeedNet	No

Source: http://varietycentral.com.au/varieties-and-rates/201617-harvest/pulse/

3.4 Planting seed quality

High-quality seed is essential to ensure the best start for your crop. Grower-retained seed, if not tested, may be of poor quality with reduced germination and vigour, as well as being infected with seed-borne pathogens.

All seed should be tested for quality, including germination and vigour.

If grower-retained seed is of low quality, then consider purchasing registered or certified seed from a commercial supplier. Always ask for a copy of the germination report, regardless of the source, and treat seed with a thiram-based fungicide.

Careful attention should be paid to the harvest, storage and handling of seed intended for sowing.

Calculate seeding rates in accordance with seed quality (germination, vigour and seed size).

Good establishment through correct plant density and good seedling vigour is important to maximise yields of pulse crops. A targeted density can only be achieved by having quality seed with good vigour and a known germination percentage to accurately calculate seeding rates. A slight variation in seed size due to seasonal conditions or an incorrect germination percentage can make a significant difference in the final plant density.

Many seed buyers are unaware that the minimum germination requirement for certified pulse seed is 70%, compared to 80% in cereal grains and far less than 90% or greater which is often obtained in pulse seed. Test results must be made available under the Seeds Act, and Australian Seeds Federation guidelines, so ensure you receive a copy.

Seed quality problems often occur when the crop does not get harvested under ideal moisture or seasonal finishing conditions. A sharp seasonal finish, a wet harvest or delayed harvest can have a big impact on seed quality.

Low germination rates and poor seedling vigour can cause slower and uneven emergence that can result in sparse establishment and a weak crop. It can also be more vulnerable to virus infection, fungal disease and insect attack, and less competitive with weeds. Any of these can result in significantly lower yields.

The fragile nature of pulse seed, particularly field pea, lentil, kabuli chickpea and lupin, makes them more vulnerable to mechanical damage during harvest and handling. This damage is not always obvious and can be reduced by slowing header drum speed and opening the concave, or by reducing auger speed and lowering the flight angle and fall of grain. Rotary harvesters and belt conveyers are ideally suited to pulse grain and can reduce seed damage that often results in abnormal seedlings, which germinate but do not develop further.

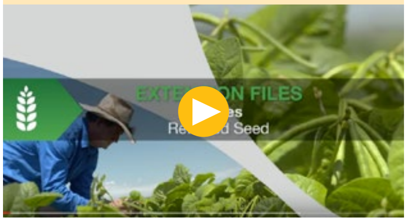
Under ideal conditions abnormal seedlings may emerge but will lack vigour, making them vulnerable to other rigours of field establishment. Factors such as low temperature, disease, insects, seeding depth, soil crusting and compaction are more likely to affect the establishment of weak seedlings. Those that do emerge are unlikely to survive for long or produce less biomass and make little or no contribution to final yield.[14]

14 W Hawthorne, W Bedggood (2007) Field peas in South Australia and Victoria. Pulse Australia Fact sheet

FEEDBACK

VIDEO

Watch GCTV16: Extension Files – Retained Pulse Seed
https://youtu.be/5Iq9T6_f6Tg



3.4.1 Grower-retained planting seed

Grower-retained sowing seed should be harvested from the best part of the crop where weeds and diseases are negligible, the crop has been vigorous and healthy, matured evenly and has good grain size. Seed from this area should be harvested first, ideally at between 11% and 12% moisture to avoid low-moisture grain that is susceptible to cracking.

Seed should be professionally graded to remove unviable seeds and weed seeds.

Seed-borne diseases have the potential to lower germination levels. Specialist laboratories can test for seed-borne diseases, such as bacterial blight in field pea.

Seed with a poor germination potential or high levels of seed-borne disease should not be sown. Cheaper costs of this seed will be offset by higher sowing rates needed to make up for the lower germination and there is potential to introduce further disease on to the property.

Do not use grain for seed of pulse crops harvested from a paddock that was desiccated with glyphosate. Glyphosate will reduce the germination, normal seedling count and vigour of the seed.

The only way to accurately know the seed's germination rate, vigour and disease level is to have it tested.[15]

MORE INFORMATION

Retaining Seed Fact Sheet: Saving weather damaged grain for seed (northern/southern regions)
http://storedgrain.com.au/wp-content/uploads/2013/06/GRDC_FS_RetainingSeed2.pdf

3.4.2 Seed size

As for most pulses, seed size varies between varieties and for different batches of a variety. To obtain the targeted plant density it is necessary to have high-quality seed and to know the seed weight and germination percentage. Do a seed count on each batch of seed for sowing to determine the weight in grams of 100 seeds.

The large size of pulse seeds makes them vulnerable to mechanical damage by the header at harvest and during subsequent handling.

A seed that has been damaged will produce an abnormal seedling: the shoot, the root, or both may be damaged.

The best time to sample is at or just after seed cleaning. This minimises the number of times the seed is likely to be augered or handled after the test is done. It also provides an ideal way to get a good representative sample. However, if you think a seed lot is likely to have reduced germination, testing should be done before seed cleaning. This minimises expenses and provides time to obtain replacement seed.[16]

15 W Hawthorne, W Bedggood (2007) Field peas in South Australia and Victoria. Pulse Australia Fact sheet

16 P Matthews, D Holding (2005) Pulse Point 20: Germination testing and seed rate calculation. NSW Department of Primary Industries, https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0005/157442/pulse-point-20.pdf

3.5 Seed testing

3.5.1 Germination

Ideally, only pulse seeds with more than 80% germination should be used and testing for germination and vigour should be done by an accredited laboratory.

A laboratory seed test for germination should be done before seeding to calculate seeding rates. However, a simple preliminary on-farm test can be done in soil after harvest or during storage. Results from a laboratory germination and vigour test should be used in seeding rate calculations (Figure 2).

$$\text{Seed rate (kg/ha)} = \frac{\text{Target plant density (pl/m}^2\text{)} \times \text{100 seed weight (grams)} \times 1000}{\text{Germination percentage} \times \text{Establishment percentage}}$$

Figure 2: *Seeding rate calculation.*[17]

Source: GRDC (2011) Retaining seed: saving weather-damaged grain for seed, GRDC Fact Sheet January 2011, www.grdc.com.au/GRDC-FS-RetainingSeed

Example seeding rate

$$\frac{45 \text{ plants/m}^2 \times 23\text{g} \times 1000}{90\% \times 90\%} = 128 \text{ kg/ha}$$

Field pea differs from other pulse crops when carrying out a home seed-germination test. When attempting to do your own field pea seed germination test it is recommended to soak the peas overnight. Use a shallow seeding tray about 5 cm deep. Place three to four pieces of paper towelling or newspaper in the base to cover drainage holes. Use clean sand, potting mix or a freely draining soil. Testing must be at a temperature of <20°C, so testing indoors may be required. Randomly count out 100 seeds per test, but do not discard any damaged seeds.

If the tray has been filled with soil, sow 10 rows of 10 seeds in a grid at the correct seeding depth. Do this by placing the seed on the levelled soil surface and gently pushing each in with a pencil marked to the required depth. Cover seed holes with a little more soil and water gently (Photo 2).

Alternatively, place a layer of moist soil in the tray and level it to the depth of sowing that will be required. Place the seeds in 10 rows of 10 seeds/row in a grid on the seedbed formed. Then fill the tray with soil to the required depth of seed coverage (i.e. seeding depth). Ensure that the soil surface is uniformly levelled, and water gently if required.

During the test, keep the soil moist, but not wet. Overwatering will result in fungal growth and possible rotting. After 7–14 days, the majority of viable seeds will have emerged. Count only normal, healthy seedlings. The number of normal and vigorous seedlings you count will be the germination percentage.

This germination test is also a vigour testing because it is done in soil. To further establish vigour under more adverse conditions, a second germination test can be done under colder or wetter conditions and used as a comparison with the normal germination test, done at the same time.[18]

17 GRDC (2011) Retaining seed: aving weather-damaged grain for seed, GRDC Retaining Seed Fact Sheet January 2011, www.grdc.com.au/GRDC-FS-RetainingSeed

18 GRDC (2011) Retaining seed: saving weather-damaged grain for seed, GRDC Retaining Seed Fact Sheet January 2011, www.grdc.com.au/GRDC-FS-RetainingSeed

Photo 2: *Conducting a germination test at home.*

Photo: Emma Leonard

3.5.2 Seed testing for disease

Many important diseases of pulses can be seed-borne. Pulse growers can minimise losses from these diseases by using high-quality seed. Seed testing is required to establish whether seed is infected. Seed health tests are currently available to detect the most important seed-borne pathogens of pulses. Only seed that is pathogen-free should be used for sowing. Testing seed before sowing will identify potential disease problems and allow steps to be taken to reduce the disease risk. Laboratory testing is usually required, as infected seed may have no visible disease symptoms.[19]

Photo 3: *Field pea seed infected with Pea seed-borne mosaic virus.*

Photo: J Davidson, SARDI

Seed-borne diseases such as Cucumber mosaic virus in field pea, lupin and lentil, along with black spot in field pea, pose a serious threat to yields. Seed-borne diseases can strike early in the growth of the crop when seedlings are most vulnerable and result in severe plant losses and hence lower yields.

When infected seed is sown, it gives rise to infected seedlings that act as a source of infection, often developing into hot spots of disease. Plants infected early often die or produce no seed. However, when late infection occurs, the seed becomes infected.

Growers who have retained seed on-farm for a number of years should test their seed for disease pathogens.

19 Agriculture Victoria (2013) Seed health testing in pulse crops. Agriculture Victoria, AG1250, June 2013, http://agriculture.vic.gov.au/agriculture/pests-diseases-and-weeds/plant-diseases/grains-pulses-and-cereals/seed-health-testing-in-pulse-crops

Testing seed before sowing will identify the presence of disease and allow steps to be taken to reduce the disease risk. If disease is detected, the seed may be treated with a fungicide before sowing or a clean seed source may be used.[20]

For more information and a list of testing services see Seed Health Testing in Pulse Crops. (http://agriculture.vic.gov.au/agriculture/pests-diseases-and-weeds/plant-diseases/grains-pulses-and-cereals/seed-health-testing-in-pulse-crops)

3.5.3 Seed grading

While excessive handling of pulse seed is not recommended, grading of seed should be considered. Grading removes small, damaged seeds from the seed lot. These seeds often produce poor seedlings, which die from pathogen attack first. The largest seed is selected, producing healthy vigorous seedlings and ensuring optimum establishment. Grading also removes sclerotes (fruiting bodies of the fungus which causes Sclerotinia), which would otherwise be sown with the seed.[21]

3.5.4 Safe storage of seed

Storing pulses successfully requires a balance between ideal harvest and storage conditions. Harvesting at 14% moisture content is ideal for grain quality and reduces mechanical damage to the seed but needs to be lower (12.5%) to avoid deterioration during storage.

Tips for storing pulses:

- Pulses stored at >12% moisture content require aeration cooling to maintain quality.
- Meticulous hygiene and aeration cooling are the first lines of defence against pest incursion.
- Fumigation is the only option available to control pests in stored pulses, and requires a gas-tight, sealable storage.
- Avoiding mechanical damage to pulse seeds will maintain market quality and seed viability, and be less attractive to insect pests.[22]

Retained seed needs to be stored correctly to ensure its quality is maintained. Ideal storage conditions for pulses are at around 20°C and at a maximum of 12.5% moisture content.

Like other grain, field pea seed quality can deteriorate in storage and the most rapid deterioration occurs under conditions of high temperature and moisture. Crops grown from seed stored under these conditions may have poor germination and emergence.

Reducing moisture and temperature increases longevity of the seed, although storage at very low moisture contents (<10%) may render field pea more vulnerable to mechanical damage during subsequent handling.

Reducing temperature in storage facilities is the easiest method of increasing seed longevity. Not only will it increase the viable lifespan of the seed, but it will slow down the rate that insect pests multiply in the grain.

VIDEO

Watch: Over the Fence: Insure seed viability with aerated storage https://youtu.be/8HFilsCnka0

20 K Lindbeck (1999) Pulse Point 7: Reducing disease risk. NSW Agriculture, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0004/157144/pulse-point-07.pdf

21 K Lindbeck (1999) Pulse Point 7: Reducing disease risk. NSW Agriculture, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0004/157144/pulse-point-07.pdf

22 P Burrill, P Botta, C Newman, C Warrick (2014) Storing Pulses. GRDC Fact Sheet, July 2014, www.grdc.com.au/GRDC-FS-GrainStorage-StoringPulses

To reduce the temperature in grain silos:

- Paint the outside of the silo with white paint. This reduces storage temperature by as much as 5°C and can double safe storage life of grains.
- Aerate silos with dry, ambient air. This option is more expensive, but in addition to reducing storage temperatures, is also effective in reducing moisture of seed harvested at high moisture content.
- Heat drying of field pea seed for sowing should be limited to temperatures ≤40°C.[23]

3.6 Safe rates of fertiliser sown with the seed

All pulses can be affected by fertiliser toxicity. Higher rates of phosphorus (P) fertiliser can be toxic to pulse establishment and nodulation if drilled in direct contact with the seed at sowing.

Practices involving drilling 10 kg/ha of P with the seed at 18-cm row spacing through 10-cm points have rarely caused any problems. However, with the changes in sowing techniques to narrow sowing points, minimal soil disturbance, wider row spacing, and increased rates of fertiliser (all of which concentrate the fertiliser near the seed in the seeding furrow), the risk of toxicity is higher. Agronomists, however, can present anecdotal reports where toxicity has not been a problem.

Toxicity effects are also increased in highly acidic soils, sandy soils, and where moisture conditions at sowing are marginal. Drilling concentrated fertilisers to reduce the product rate per hectare does not reduce the risk.

The use of starter nitrogen (N), e.g. DAP, banded with the seed when sowing pulse crops has the potential to reduce establishment and nodulation if higher rates are used. On sands, up to 10 kg/ha of N at 18-cm row spacing can be safely used. On clay soils, do not exceed 20 kg/ha of N at 18-cm row spacing.

Deep banding of fertiliser is often preferred for lupin and other pulses, or else broadcasting and incorporating, drilling pre-seeding or splitting fertiliser applications so that lower rates of P or no P is in contact with the seed.

MORE INFORMATION

For more information, see Section 12 Storage.

23 W Hawthorne, W Bedggood (2007) Field peas in South Australia and Victoria. Pulse Australia Fact sheet