GOLDEN RULES FOR CANOLA IN THE LOW-RAINFALL ZONE

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COVER: Flowering canola in the eastern wheatbelt of WA

PHOTO: CussonsMedia

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Introduction

Canola is increasingly being grown outside its traditional Western Australian heartlands in the state's medium to high-rainfall cropping areas and becoming an important part of farming systems in the low-rainfall zone (LRZ).

Grains Research and Development Corporation (GRDC) initiated this booklet to assist growers in the LRZ, or Agzone 4, to maximise the potential of this important break crop in their unique environment.

This publication consolidates available research on successfully growing canola in the LRZ of WA and addresses key agronomic issues including crop establishment, plant nutrition, harvesting, and weed, disease and insect management.

The issue of crop establishment covers factors such as paddock selection, variety choice, time of sowing, sowing rate, seed size, seeding depth, row spacing and seed placement.

Decisions on time of sowing – and whether it is best to sow canola early and dry or early and after rain – are complex, as establishment depends on subsequent environmental conditions. While early sowing has its merits in the LRZ, years of successive dry starts have contributed to large areas requiring resowing due to poor canola establishment.

The booklet also contains six case studies of canola growers from eastern areas of WA's Geraldton and Kwinana port zones, detailing their insights and approaches to soil amelioration, time of sowing, herbicide packages, seed size, late-season pests and more.

A common message from these growers is the need to have a break crop, such as canola, in the rotation as a tool to help grow clean cereal crops. Many consider canola their best option in terms of a weed clean-up tool with the potential to also generate a profit.

Given recent challenging seasons, a key focus of the growers when interviewed in 2020 was to have flexibility in their cropping programs so they could adjust them depending on the seasonal conditions.

Although there are a number of management strategies that can be used to maximise the potential of canola, growers in the LRZ said being under the right rain cloud at the right time was the biggest factor in growing a profitable crop.

This publication is designed to be a practical resource and is available as a hard copy through GRDC's Perth office. For more information and to receive a copy, telephone 08 9230 4600.

On behalf of GRDC, I would like to sincerely thank all the growers, researchers and others who consented to being included as case study participants or provided input and time to this booklet.

Jo Wheeler

GRDC grower relations manager – west

Why grow canola in the low-rainfall zone?

Canola is an important crop in Western Australia, being the third-largest winter crop after wheat and barley, with an estimated crop area of 940,000 hectares (ABARES, 2020). Traditionally it has been grown in the medium to high-rainfall regions, but more recently it has been adopted by growers in the low-rainfall zone (LRZ). The LRZ, or Agzone 4, encompasses an area from Mullewa in the north through to Merredin and Southern Cross in the south and is characterised by an annual rainfall of 250 to 325 millimetres.

Increased opportunities to grow canola in the LRZ have been enabled by the adoption of minimum tillage, allowing early dry sowing. Additionally, the release of shorter season varieties, which have a good fit for the LRZ, has given growers more confidence to successfully grow canola in these areas. The introduction of herbicide-tolerant canola, in particular glyphosate-tolerant, provides growers with additional herbicide options to tackle resistant ryegrass and wild radish.

Canola offers numerous rotational benefits and is an important break crop providing several agronomic benefits, including cereal root disease control, nematode control and improved weed control. Many growers in the LRZ are choosing to plant canola over lupins due to increased profitability and better weed control options.

Canola can be grown over a range of environmental conditions; however, to keep risks low the following is recommended:

- **adjust cropping programs to remove canola if conditions are not favourable;**
- **manage summer weeds to conserve subsoil moisture;**
- **ideally sow into paddocks with subsoil moisture;**
- **sow before the end of April with minimum tillage;**
- **sow shallow (1 to 1.5 centimetres deep) with large seed (> 2mm);**
- **select shorter season varieties suitable for the location;**
- **choose a herbicide system that best fits the paddock requirements; and**
- **apply adequate nutrition for the soil type to achieve target yields.**

Profitability of canola in the low-rainfall zone

Increased canola plantings in the LRZ have largely been attributed to the higher profitability and better weed control of canola compared to other break crops. LRZ growers are opportunistic about growing canola; therefore, if the season is not favourable, growers need to be flexible enough to remove it from their program.

Profitability is dependent on many factors; therefore, it is only possible to provide an average indication of the profitability of canola in the LRZ (Table 1).

It is evident from the gross margins in Table 1 that triazine-tolerant (TT) canola is more profitable than glyphosate-tolerant (GT) canola in both the Kwinana East and Geraldton East LRZ. This is largely due to the high seed costs and lower grain prices associated with GT canola. In many instances, particularly in the north, GT canola is preferred to TT canola for its improved control of resistant weeds, and this needs to be taken into consideration.

Table 1: Total variable costs and gross margins of triazine-tolerant (TT) open-pollinated and glyphosate-tolerant (GT) canola in the Kwinana East and East Geraldton LRZ.

	East Geraldton	Kwinana East	East Geraldton	Kwinana East
	TT	TT	GT	GT
Expected yield	0.8	1	0.8	1
Net price ($/tonne on-farm)[1]	597	604	507	517
Gross income	478	604	406	517
Pre-sowing herbicides	29	32	20	28
Seed cost and seed dressings	0	1	78	79
Insecticides at sowing/post-sowing pre-emergent	2	5	2	4
Fertiliser at sowing[2]	59	77	59	77
Post-emergent nitrogen[3]	55	22	55	22
Post-emergent herbicides[4]	22	18	22	22
Post-emergent insecticides	29	2	29	2
Operations[5]	97	91	97	91
Total variable costs ($/ha)	**293**	**248**	**362**	**325**
Gross margins ($/ha)	**185**	**356**	**44**	**192**

[1] Source: Emerald Grain Price as of 12/06/20, 2019-20 season

[2] Kwinana East N: 20.199, P: 10.125, K: 7.5, S: 7.19, Cu: 0.075, Zn: 0.15 and East Geraldton N: 16, P: 9.1, S: 14.1, Cu: 0.1 and Zn: 0.2

[3] Kwinana East N: 18.4 and East Geraldton N: 46

[4] East Geraldton included an aphid spray using Transform® with Isoclast® in addition to Affirm®, which is a more expensive insecticide to treat diamondback moth, whereas a cheap cypermethrin was used in the Kwinana East gross margin.

[5] Operations include seeding, boomspray, fertiliser and harvest applications.

Source: Peter Elliott Lockhart, Elders Geraldton; and Sophie Hooper, Elders Merredin

Crop establishment

Paddock selection

Canola grows well in a range of soil types; however, it is sensitive to low pH and high levels of aluminium. It is best grown in soils with a pH of 5.0 to 8.0 (calcium chloride, $CaCl_2$), and growers should consider liming where pH is low. WA Department of Primary Industries and Regional Development (DPIRD) trials have shown applications of lime on acid soils have a large initial response in yields in the canola rotation (Gazey, 2018). Select paddocks with low waterlogging, wind erosion and frost risks, along with good subsoil moisture and nitrogen levels, to successfully grow canola.

Although diseases are not as common in the LRZ as in higher rainfall zones, it is still important to maintain at least a three to four year break between broadleaf crops to minimise the risk of blackleg and Sclerotinia stem rot. Consider weed burdens in the paddock and determine if canola offers an effective weed control option.

Variety choice

Open-pollinated

Open-pollinated (OP) seed is created by self-pollination and can be harvested and retained on-farm for use at sowing. This has been the main type of canola grown in Western Australia in the past, with low seed costs making it a low financial risk in the LRZ; however, it is often lower yielding than hybrids and weed control can often be compromised.

Hybrid

Hybrids are becoming more popular in WA; however, seed costs are higher and seed cannot be retained from year to year, making them a higher financial risk in the LRZ. Some hybrid varieties have an end point royalty (EPR), which can reduce upfront seed cost and risk, making them a good option for the LRZ. Hybrids are grown primarily for effective weed control in the LRZ.

Herbicide tolerance

Herbicide tolerance in canola offers growers alternative weed control options. Currently there are several herbicide tolerance systems available, including:

CONVENTIONAL CANOLA
Conventional canola has no tolerance to specific herbicides and, therefore, broadleaf control is often limited; consequently it is not widely grown.

TRIAZINE-TOLERANT CANOLA
TT is the most commonly grown canola in WA. It is available as OP or hybrid varieties, with OP varieties being generally lower yielding. Triazine herbicides, including atrazine, simazine or terbuthylazine, can be applied pre-emergent or post-sowing pre-emergent (PSPE). Atrazine and terbuthylazine can be applied post-emergent to small, actively growing weeds.

GLYPHOSATE-TOLERANT CANOLA
Roundup Ready® canola is tolerant to glyphosate, which can be applied from crop emergence up to the six-leaf crop stage.

TruFlex® technology offers higher glyphosate rates and an extended window for glyphosate to be applied from crop emergence through to the first canola flower. In the LRZ this could be beneficial, particularly in years when establishment is patchy, which makes post-emergent herbicide applications within a limited spraying window challenging with Roundup Ready® canola.

Products registered for use in Roundup Ready® and TruFlex® systems include, Roundup Ready with PLANTSHIELD®, Roundup Ready® PL Herbicide, weedmaster® DST® and CRUCIAL®.

Optimum® GLY technology offers similar benefits to TruFlex® with an extended spray window. Products registered for use include CRUCIAL® and weedmaster® DST®.

Growers are urged to refer to the relevant glyphosate system technical manual to minimise the evolution of glyphosate herbicide resistance.

IMIDAZOLINONE TOLERANCE
Imidazolinone (IMI)-tolerant canola, which includes Clearfield® (CL) cultivars, allows the use of the Group B herbicides imazapic + imazapyr (for example, Sentry®) and imazamox + imazapyr (Intercept® and Intervix®). Sentry® is registered for pre-emergent and post-emergent use, while Intercept® and Intervix® are registered for post-emergent use only from the two to six-leaf crop stage. IMIs have a long soil residual in the soil, which in the LRZ and acid soils can cause plant-back issues for non-tolerant crops the following year.

TT AND GT TOLERANCE
This is a dual-stacked gene technology, where TT has been combined with Roundup Ready® and TruFlex® technology, offering residual weed control.

TT AND IMI TOLERANCE
Combining TT and IMI tolerance enables applications with groups C and B herbicides, allowing growers to target specific weed problems such as dock, fumitory, ryegrass and wild radish.

GT AND IMI TOLERANCE
This stacked gene technology combines the TruFlex® trait with IMI tolerance, offering a wider spray window and IMI tolerance, which can be beneficial in the LRZ where plant-back periods from IMIs used the previous year can be an issue.

Choosing the right system

Careful consideration as to which system best suits individual paddocks should be taken. TT varieties offer low-cost weed control with intermediate effectiveness; however, GT varieties offer high levels of weed control without yield penalty, but input costs are higher and GT grain potentially attracts lower grain prices (Zhang et al., 2018). Short-season hybrid TT varieties demonstrated promising results across a wide range of emergence dates in DPIRD trials at Mullewa during 2019 (Harries et al., 2020), potentially making them an option for the LRZ. IMI canola technology can be a good fit where IMI wheat is being grown in the rotation to avoid any plant-back issues. However, the following crop to be grown after IMI canola needs to be carefully chosen to avoid damage from IMI residues. Dual-tolerance varieties combining IMI and GT technology mitigate the risk of any plant-back issues from IMI herbicides, particularly after low rainfall, and give growers the option of utilising the GT technology for good weed control.

Yield differences between TT, IMI and conventional canola are

small and insignificant in low-rainfall zones and low-yielding environments (Zhang et al., 2018). Growers could consider changing from OP TT varieties to TT hybrid varieties in the LRZ during wet years when the yield potential is likely to be between 1.1 and 1.9 tonnes per hectare (Zhang et al., 2018). While GT will have some yield benefits in medium to high rainfall, in low rainfall the yield difference is small (Zhang et al., 2018). The adoption of GT canola in the LRZ, particularly in the north, has largely been driven by improved weed control, particularly with herbicide resistant weeds.

Some popular varieties commonly grown in LRZ include:

TRIAZINE-TOLERANT

ATR Bonito⁽ᐞ⁾

- TT (OP);
- good early vigour for strong establishment;
- early–mid maturity;
- moderately susceptible to blackleg; and
- short to medium in height.

Telfer

- TT (OP);
- early maturing; and
- no longer commercially available.

HYBRID TRIAZINE-TOLERANT

HyTTec® Trident

- TT hybrid;
- early maturing, suitable for low-rainfall areas;
- resistant against blackleg;
- medium to tall plant height;
- high yielding compared to other TT hybrids; and
- EPR $10/t (ex GST).

HyTTec® Trophy

- TT hybrid;
- early–mid maturity;
- resistant against blackleg;
- medium to tall plant height;
- high yielding with good early vigour; and
- EPR $10/t (ex GST).

GLYPHOSATE-TOLERANT

DG 408RR

- GT hybrid;
- early–mid maturity; and
- high yielding with high oil content.

Hyola 404RR

- GT hybrid;
- early–mid maturity;
- moderately resistant to blackleg;
- medium to high plant height, can be direct harvested; and
- good lodging resistance.

InVigor® R 3520

- GT hybrid with excellent vigour;
- early–mid maturity, ideal for tough conditions;
- medium plant height, ideal for direct harvesting; and
- good resistance to lodging.

Pioneer® 43Y23

- GT hybrid with exceptional vigour;
- early maturing, recommended for low and medium-rainfall zones;
- resistant blackleg rating;
- short plant height; and
- good pod shatter tolerance.

Pioneer® 44Y27

- GT hybrid;
- early–mid maturity;
- resistant blackleg rating;
- delivers excellent early growth and crop competition resulting in enhanced weed control;
- short plant height, with good lodging resistance and even ripening; and
- ideal for direct heading.

Pioneer® 43Y29

- GT hybrid with exceptional vigour;
- early maturing, recommended for low and medium-rainfall zones;
- good early growth and competition providing enhanced weed control;
- resistant blackleg rating; and
- ideal for direct heading.

GLYPHOSATE-TOLERANT – TRUFLEX®

Hyola 410XX

- TruFlex® release, GT;
- early–mid maturity;
- offers extended glyphosate spray window up until first flower;
- resistant (provisional company rating) to blackleg;
- medium to high plant height, ideal for direct harvesting; and
- good lodging resistance and even flowering.

InVigor® R 4022P

- GT hybrid with TruFlex® technology;
- early–mid maturity;
- offers extended glyphosate spray window up until first flower;
- high yielding;
- resistant blackleg rating; and
- PodGuard® technology – strengthens pods and reduces pod shatter.

GLYPHOSATE AND TRIAZINE-TOLERANT

InVigor® 3000TR

- dual tolerance – glyphosate and triazine hybrid;
- early–mid maturity;
- indeterminant, adapts well to range of seasonal conditions;
- good early vigour;
- medium plant height; and
- good resistance to lodging.

GLYPHOSATE AND IMIDAZOLINONE-TOLERANT

Hyola 540XC

- dual tolerance – glyphosate TruFlex® and IMI hybrid;
- mid–early maturity;
- resistant to blackleg;
- medium to high plant height, manageable for direct harvesting; and
- good lodging resistance and shatter tolerance,

Future breeding work

DEEP ROOTS

New research in southern New South Wales has shown long-season canola can yield well in dry seasons due to extensive roots systems (two metres or more) utilising stored soil moisture (Kirkegaard et al., 2020). Average yield gains of 0.4t/ha were recorded over two years, which demonstrates the capacity of these slower developing varieties to make use of stored water to yield well in a tough finish. Perhaps there is potential for this research to be further investigated for applicability in the LRZ.

GENETIC TRAITS FOR IMPROVED ESTABLISHMENT

A joint GRDC and CSIRO project is identifying genes for longer hypocotyls in Australian and international canola varieties. Furthermore, varieties with improved seedling vigour and reduced potential for secondary dormancy in canola when sown into marginally moist soil and high temperatures are being explored. The aim of this work is to provide canola breeders with the knowledge and tools to develop canola varieties with improved establishment-related characteristics, such as sowing deeper to make use of stored soil moisture and escape extreme surface temperatures experienced with early sowing (M. Nelson pers. comm. July 2020). These varieties could be invaluable for establishing canola in the LRZ.

Time of sowing

Sowing canola early is key to maximising yields, as early-sown crops are better able to utilise stored soil moisture. It is considered standard practice for canola to be sown mid-April in northern cropping zones (Harries et al., 2018). Yield gains of an extra 40 kilograms per hectare per day were achieved by sowing in mid-April rather than late April in Binnu (Harries et al., 2018). This has been further backed by Agricultural Production Systems sIMulator (APSIM) modelling work, which suggests canola should be sown by mid-April, particularly in the low and medium-rainfall zones to maximise yields (Farre et al., 2018).

Early sowing helps avoid heat stress later in the season, which can cause pod abortion. Canola is most sensitive to heat stress a week prior to flowers opening until a week after (Harries et al., 2018). DPIRD trials in Geraldton have shown when canola was planted in early April it produced more pods, larger seed and more seeds per pod compared to later plantings (Harries et al., 2018).

While early sowing has its merits in the LRZ, years of successive dry starts have contributed to large areas needing to be resown due to poor canola establishment. To minimise this risk, growers are considering growing shorter season varieties that are adaptable over a range of sowing times, enabling later sowing if early seasonal conditions are poor. With this in mind, breeders are looking to release some lines that may be planted mid to late May and still offer competitive yield and oil. These lines will limit the risk of planting a high-value crop early into less-than-desirable conditions; however, growers will require some education so they are not planting too early, as there is potential for them to run up too quickly in some environments (M. Hickey, Nuseed pers. comm. September 2020). Additional benefits of planting slightly later into moisture should include better establishment of more vigorous canola plants, resulting in increased crop competition, which is invaluable for weed management (M. Hickey, Nuseed pers. comm. September 2020).

The decision on whether it is best to sow canola early and dry or early and after rain is a complex one, as field establishment really depends on the subsequent environmental conditions (M. Harries pers. comm. June 2020). Canola establishment at Eradu in 2017 was higher in crops sown 40 days before and just prior to the season break, resulting in higher yields than crops sown after rain into marginal moisture (Harries et al., 2018). In contrast, in DPIRD trials at Mullewa during 2019, crops sown in mid-March had poor establishment compared to early April sowing (Harries et al., 2020). Also, DPIRD trials in 2018 at Mullewa sown at three different times (15 March, 5 April and 26 April), were all unsuccessful due to very hot conditions (Farre et al., 2019). This highlights how hot conditions in the LRZ could limit how early crops can be sown. Further trials, with GRDC investment, are being conducted by DPIRD and CSIRO looking at field establishment of canola in WA, including some trial work in the LRZ.

In addition to challenging environmental conditions such as heat and drying soil, early-sown crops on sandy soils can be subject to furrow fill, which can reduce plant emergence, vigour and density.

Importantly, if seasonal conditions are not conducive for early sowing, growers need to assess if target yields or break-even yields can be achieved, and if not, be prepared to cut canola from their programs.

Sowing rate

Optimum plant density to maximise canola gross margins depends on grain price, seed cost, seed size, germination percentage and field establishment (French et al., 2018). The target plant density for hybrid and OP varieties in the LRZ is shown in Table 2.

Table 2: Suggested plant density for canola (plants/m^2) in low-rainfall zone (250 to 325mm) for hybrid and open-pollinated varieties.

Hybrid	Open-pollinated
20 to 25	30 to 40

Source: DPIRD

The difference in density is driven almost entirely by the cost of seed (French et al., 2018), which is why OP varieties (which can be retained for seed and therefore cost less) have a higher target plant density compared to hybrids, which have to be purchased new each year. To ensure a competitive crop with good weed control, plant densities should be kept above 20 plants/m^2 (Bucat et al., 2019). Seeding rates range from 1 to 2kg/ha in the LRZ, which can be increased if sowing into marginal moisture.

Seed size

Seed quality has a significant impact on establishment and crop performance. Large seed produces a vigorous seedling, and sowing with larger seed will result in higher field establishment at variable depths compared to small seed (Harries et al., 2018). To maximise establishment, growers retaining OP seed should grade seed to greater than 2mm to ensure ideal plant establishment.

Seeding depth

To ensure good plant establishment, canola should be sown at 1 to 1.5cm deep. It may be tempting to chase soil moisture by sowing deeper, especially if summer rainfall has been significant. However, trials have shown canola sown deeper than 1cm reduced plant establishment and yield (Harries et al., 2018). In this work, the best establishment and yields were achieved when canola was sown 1 to 1.5cm deep, even when subjected to challenging environmental conditions.

Row spacing

Canola has traditionally been grown on narrow rows; however, DPIRD trials have found canola grown on wide rows (50cm) does not compromise yields in the north (Harries et al., 2018). In this work, the combination of wide rows and low seeding rate achieved the highest yields, potentially offering savings for growers planting hybrid varieties that incur high seed costs. In the LRZ, wide row spacing may help conserve moisture until later in the season potentially 'drought proofing' canola (Harries et al., 2019). Additionally, wide row spacing may help reduce fuel costs. Care should be taken in paddocks with high weed burdens as lower plant densities may provide less crop competition.

Seed placement

Seed placement results from DPIRD canola trials in Wongan Hills indicate plant distribution has a greater effect on yield at low plant density compared to high plant density (Harries et al., 2018). New research observed canola yield increases of up to 17 per cent when plants were sown evenly spaced apart, compared to spacing observed in commercially grown canola crops (Harries et al., 2019). Improved yields are likely if plants are established with uniform spacing, in addition to other benefits such as improved weed competition and fertiliser use efficiency (Harries et al., 2019). The use of precision seeders in the LRZ to achieve uniform planting and improve yield is something to be considered by growers.

Plant nutrition

Canola is considered to be very efficient at extracting nutrients from the soil (Brennan et al., 2019) and removes a significant amount of nutrients at harvest from the seed and stubble (Table 3). Soil testing before sowing is recommended to get an accurate measure of available nutrients so fertiliser rates can be adjusted accordingly. Soil sampling (10 to 20cm and 20 to 30cm) is recommended to determine if nutrients are available at depth. Other constraints such as soil acidity, high levels of aluminium and subsoil compaction, which may limit plant root access to these nutrients, should also be addressed. If soil tests indicate a nutrient deficiency, plant tissue tests can also be used to fine-tune nutritional requirements in season.

Nitrogen (N)

Nitrogen is the largest and most costly input for canola (Brennan et al., 2019). It is important for crop growth and increases yields; however, when applied at high rates it can affect oil content. A nitrogen strategy should consider target yields, soil available nitrogen and rainfall.

In the LRZ, often one of the first input costs to be cut is fertiliser, particularly nitrogen. Common practice is to apply some nitrogen at seeding and then a top-up six to eight weeks after sowing. Recent work has shown that delaying the post-emergent application closer to stem elongation (12 weeks after sowing) produced similar yields and oil content to an earlier application (Seymour et al., 2018). This may give growers in low-rainfall zones the opportunity to hold off on additional nitrogen applications until later, particularly in years when seasonal prospects are unclear. Nitrogen rates in low rainfall range from 25 to 50kg/ha (Hocking et al., 1999), depending on seasonal conditions. Canola seed is very sensitive to burn from fertiliser, therefore any nitrogen applied at sowing should be separated from seed.

Sulfur (S)

Canola has a very high requirement for sulfur compared to wheat and legume crops (Brennan et al., 2019). Sulfur deficiency is more common on sandy soils where nutrients are easily leached from the root zone.

Soil testing for sulfur is recommended and the critical value for Colwell S is 10 milligrams per kilogram (Chen et al., 2011). It is recommended where test results for the top 10cm fall below this critical value, then the 10 to 20cm and 20 to 30cm horizons should also be tested. If soil test levels of sulfur are above the critical value in either of these horizons, then a grain yield response to applied sulfur is unlikely (Chen et al., 2011). Sulfur is usually applied at seeding and again post-emergent if required.

Table 3: Range and average nutrient contents found in one tonne of canola seed and stubble over a range of growing seasons.

	Nutrient content (kg/t)						Nutrient content (g/t)		
	Nitrogen (N)	Phosphorus (P)	Potassium (K)	Sulfur (S)	Magnesium (Mg)	Calcium (Ca)	Copper	Zinc	Manganese
Seed	26 to 40	2 to 6	6 to 9	3.2 to 6	2 to 4	2 to 4	1.5 to 5	22 to 45	16 to 40
Average	33	4	7	4	2.5	2.5	2.1	30	27
Stubble	6 to 10	1 to 3	18 to 30	3.4 to 6.5	0.6 to 2	4 to 7	2 to 6	10 to 15	10 to 30

Source: Ross Brennan, DPIRD

Phosphorus (P)

Canola's requirement for phosphorus is high during early stages of growth, although canola requires less phosphorus than cereals (Bolland, 1997). The critical value for Colwell P is 25mg/kg (Chen et al., 2011). DPIRD trials have shown yield responses in the LRZ of 70 to 200kg/ha when P soil test levels were greater than 20mg/kg (Seymour et al., 2018). Generally, rates of 9 to 10kg/ha of phosphorus are applied at seeding in compound fertiliser. High rates of phosphorus near the seed can be toxic so it is best to separate seed and fertiliser.

Potassium (K)

Potassium is required for many plant processes, including photosynthesis, ion balance and water use efficiency, and is required in higher amounts than phosphorus (Brennan et al., 2019). Deficiency is more likely to occur on deep white sands and deep sandy duplex soils; however, deficiencies have been observed on sandy duplex soils and sandy gravels over clays. The critical value for Colwell K is 52 (Chen et al., 2011); however, as potassium is mobile within the soil and prone to leaching, sampling at depth is suggested. Potassium can be applied at seeding or top-dressed post-emergent.

Weed control

Several herbicide-tolerant systems are available, offering a wide range of herbicide options. Careful consideration regarding weed burden and herbicide resistance needs to be taken when choosing which system(s) to use. To increase flexibility with crop options in the event of a poor canola germination, growers in the LRZ should carefully consider the timing and use of some pre-emergent herbicides such as propyzamide and atrazine. Several growers featured in the case studies in this booklet are planning to remove propyzamide from their pre-emergent spray as their options to resow with cereals are restricted, while others only consider applying atrazine once seasonal conditions are more suitable. For more detailed information on herbicides registered in canola, refer to the DPIRD publication, **Chemical weed control in canola**:
https://grdc.com.au/resources-and-publications/all-publications/publications/2020/chemical-weed-control-in-canola

Please note: the herbicide information detailed in this section are not recommendations and growers are advised to always refer to the label for herbicide rates, timing and compatibilities.

Integrated weed control

To reduce the onset of herbicide resistance, an integrated weed management (IWM) plan should be implemented to manage weed populations long term. An IWM plan may be required for each paddock, depending on the paddock history, weed seedbank levels and to match appropriate IWM tactics to the weeds present and the crop type. IWM tactics should cover cultural and chemical control methods, including:

- stopping weed seed-set in the previous year's crop/pasture, for example, crop-topping and spraytopping;
- planting weed-free seed;
- planting competitive crop varieties in paddocks where weed numbers are high;
- rotating crop types, allowing the use of herbicides with different modes of action;
- encouraging insect predation of weed seeds by limiting the use of broad-spectrum insecticides;
- delaying sowing in paddocks with high weed numbers to ensure a good knockdown;
- using double-knock where possible;
- not cutting label rates;
- ensuring in-crop weed control is effective, for example, robust rates and good coverage;
- considering a fallow if weed numbers blow out;
- practising good farm hygiene to prevent the movement of resistant weed seeds;
- implementing harvest weed seed control, for example, seed impact mills, windrow burning, chaff carts and baling; and
- testing weed seeds if herbicide resistance is suspected.

Pre-emergent weed control

To ensure good early weed control, pre-emergent herbicides should be applied with a knockdown herbicide, such as glyphosate, paraquat or Spray.Seed®, when seasonal conditions allow. Always refer to the label for recommended compatibilities.

ALL CANOLA SYSTEMS

Table 4 shows the registered pre-emergent herbicides for use in canola. Care should be taken with applying propyzamide and atrazine early in the season if seasonal conditions are poor. If these herbicides are not applied, there is greater flexibility to resow with cereals if canola establishment is poor.

Table 4: Common pre-emergent herbicides registered for use in canola.

Herbicide	Group	Rate (litres per hectare)	Key weeds controlled
Trifluralin 480g/L a.i.	D	1.2 to 1.7	Ryegrass, wireweed, fumitory
Tri-allate (Avadex® Xtra) 500g/L a.i.	J	1.6 or 3.2	Wild oats. Rates depend on seeding system: high rate for no-till, low rate for full disturbance
Pendimethalin (Stomp®440) 440g/L a.i	D	1.35 to 2.25 1.5 to 2.25	Ryegrass, wireweed, suppression of wild oats Suppression of silvergrass
S-metolachlor (Dual Gold®) 960g/L a.i.	K	0.15 to 0.25	Toad rush
Propyzamide (Rustler®) 500g/L a.i.	D	1	Ryegrass, barley grass, great brome, silvergrass, wintergrass, wild oats
Metazachlor (Butisan®) 500g/L a.i.	K	1.5 to 1.8 1.8	Ryegrass only Barley grass, brome grass, capeweed, toadrush, wild oats, wireweed
Tri-allate 550g/L a.i. + trifluralin 350g/L a.i. (Jetti Duo®)	J,D	1.45 to 1.8	Ryegrass including trifluralin-resistant ryegrass, wild oats, brome grass. Suppression of wireweed, barley grass
Trifluralin 125g/L a.i. + oryzalin 125g/L a.i. (Yield®)	D	2.3	Ryegrass, wireweed. Suppression of silvergrass. Partial suppression of wild oats, fumitory

a.i. – active ingredient

Source: APVMA PubCRIS database

Table 5: Pre-emergent herbicide options registered for TT canola.			
Herbicide	Group	Rate (kg/ha)	Key weeds controlled
Atrazine 900g/kg a.i.	C	1.1 to 2.2	Range of grass and broadleaf weeds
Simazine 900g/kg a.i.	C	1.1 (light soil) 2.2 (heavy soil)	Range of broadleaf weeds and suppression of some grasses Often applied with atrazine for improved weed control
Terbuthylazine 875g/kg a.i.	C	0.86 to 1.20	Range of broadleaf weeds and suppression of ryegrass, doublegee, phalaris, wild oats and wild radish

Source: APVMA PubCRIS database

Table 6: Common post-emergent herbicides registered for use in canola.				
Herbicide	Group	Rate	Key weeds controlled	Crop growth stage
Clethodim 240g/L a.i.	A	150 to 500mL/ha	Range of grasses and volunteer cereals	DO NOT apply after flower buds become visible
Haloxyfop 520g/L a.i.	A	75 to 100mL/ha	Range of grasses and volunteer cereals	DO NOT apply after the 8-leaf stage or after the commencement of stem elongation – whichever occurs first
Clopyralid (Lontrel®) 750g/kg a.i	I	60 to 120g/ha	Capeweed, skeleton weed, clover, medic, chickpea, field pea, lentil. Suppression of lupin and faba bean	2 to 8 leaf

Source: APVMA PubCRIS database

TRIAZINE-TOLERANT SYSTEM

Atrazine, simazine and terbuthylazine are registered for use in TT canola at pre-emergence or PSPE as shown in Table 5. Best results will be achieved when triazine herbicides are incorporated into moist soil. Triazines can be applied in combination with any of the herbicides listed in Table 4 to improve weed control. Care should be taken when using S-metolachlor, propyzamide and metazachlor as yield reductions have been observed in some TT varieties (Dhammu et al., 2018).

GLYPHOSATE-TOLERANT SYSTEM

This system works best with a pre-emergent herbicide from another herbicide group, such as propyzamide or metazachlor (Butisan®), to provide residual control of grasses. If a knockdown herbicide is being used, paraquat is suggested to limit the number of glyphosate applications.

IMIDAZOLINONE SYSTEM

A knockdown herbicide should be used if seasonal conditions permit. Trifluralin, triallate, S-metolachlor, propyzamide, pendimethalin and metazachlor are all registered options in IMI-tolerant canola (Table 4).

Post-emergent weed control

ALL CANOLA SYSTEMS

All canola systems can be treated with the herbicides listed in Table 6 for post-emergent weed control. Always refer to the label when mixing with other herbicides.

TRIAZINE-TOLERANT SYSTEM

Post-emergent applications with atrazine and terbuthylazine should be applied to ryegrass (one to two leaf) and small broadleaf weeds at the rates in Table 7. Atrazine and clethodim can be applied in one pass early post-emergent; however, this can reduce the efficacy of clethodim. The addition of ammonium sulfate can help reduce the antagonism. For best results, apply grass-selective herbicides to small actively growing weeds prior to canopy closure.

Table 7: Post-emergent triazine rates registered for TT canola.	
Herbicide	Rate (kg/ha)
Atrazine 900g/kg a.i.	0.555 to 1.1
Terbuthylazine 875g/kg a.i.	0.6 to 1.2

Source: APVMA PubCRIS database

GLYPHOSATE-TOLERANT SYSTEM

Two applications of Roundup Ready® herbicide with PLANTSHIELD® at 0.9kg/ha (690 grams per kilogram a.i.) can be applied post-emergent up to the six-leaf crop stage. Varieties with TruFlex® technology can have either two applications of Roundup Ready® herbicide with PLANTSHIELD® at 1.3kg/ha or three applications at 0.9kg/ha. These can be applied up until first flower. Other registered herbicides for these systems include Roundup Ready® PL Herbicide, weedmaster® DST® and CRUCIAL®. Refer to labels for rates.

The Optimum® GLY system can have three applications of CRUCIAL® (600g/L glyphosate) at 1 to 1.8 litres per hectare applied from cotyledon to 10 per cent flowering crop stage. Weedmaster® DST® (470g/L glyphosate) can be applied three times ranging from 1.3 to 2.3L/ha from cotyledon to the 10 per cent flowering crop stage. Mixtures with clopyralid offer improved broadleaf control in these systems. Always refer to the label for recommended compatibilities.

IMIDAZOLINONE SYSTEM

Post-emergent application rates for Sentry® vary from 20 to 40 or 55g/ha depending on the weed species. Intervix® can be applied early post-emergent at 300 to 500mL/ha; a higher rate of 600 to 750mL/ha is registered for selected weeds. Post-emergent herbicides should be applied to the crop from the two to six-leaf stage and the addition of grass selectives can provide improved grass control. Best results will be achieved when grass-selective herbicides are applied to small actively growing weeds. If other weeds require control, additional herbicides should be applied at least two weeks after Intervix®, Intercept® or Sentry®.

Table 8: Herbicides registered for crop-topping.

Herbicide	Rate (L/ha)	Weeds controlled	Withholding period to harvest
Weedmaster® DST® glyphosate 470g/L a.i	1.4 to 4.1	Annual weeds	5 days
Roundup Ultra® MAX glyphosate 570g/L a.i	1.2 to 3.4	Annual weeds	Nil when used as directed
CRUCIAL® glyphosate 600g/L a.i	1.1 to 3.2	Annual weeds	5 days
Diquat (Reglone®) 200g/L a.i	1.5 to 3.0	Annual weeds	4 days

Source: APVMA PubCRIS database

Pre-harvest weed control

The application of non-selective herbicides (Table 8) close to crop maturity, known as crop-topping, can help reduce the number of weed seeds replenishing the soil seedbank. It can be particularly useful in controlling weeds that have escaped in-crop weed management and can also aid in the even ripening of the crop. Glyphosate products should be applied to mature standing crops when 20 per cent of seeds from the main stem (at different heights) have turned dark brown/black in colour; alternatively, it can be applied at the same time as windrowing (Dhammu et al., 2020). Diquat is best applied when 70 per cent of the pods are yellow and seeds are brown/bluish and pliable (Dhammu et al., 2020).

Diseases

Canola is susceptible to several fungal diseases including blackleg and Sclerotinia stem rot, but these are generally more damaging in high-rainfall areas. However, in seasons when rainfall is above average, crops in the LRZ could be affected. The downloadable apps noted below are handy tools to assist growers with integrated disease management decisions regarding fungicide applications for blackleg and Sclerotinia stem rot.

Blackleg

Blackleg is a major fungal disease of canola, causing stem cankers that can lead to yield losses. Management of blackleg is best tackled with a mix of strategies:

- blackleg survives on crop stubble residues, so ensure there is a three to four-year gap between canola crops;
- select varieties with a resistant blackleg rating, particularly in high-risk areas; and
- in high-risk situations, a fungicide can be applied from the 4 - 6 leaf stage.

A downloadable app, BlacklegCM, can assist growers to determine the best and most profitable strategy to manage blackleg.

Sclerotinia stem rot

Sclerotinia is a fungus causing stem rot in canola and other broadleaf crops, leading to yield losses. It can be difficult to predict and is often worse when prolonged wet and humid conditions occur during flowering. Management strategies include:

- ensuring a three to four-year gap between canola and other susceptible crops;
- avoiding sowing close to a previously infected crop;
- using seed free from sclerotinia; and
- timely application of fungicide between 20 and 50 per cent (full bloom) flowering if required.

A downloadable app, SclerotiniaCM, developed by DPIRD and GRDC, assists growers with decisions regarding fungicide applications and the likely economic returns.

Insect control

Canola crops are generally most vulnerable to a range of insects and mites during establishment and from flowering through to maturity. However, in the LRZ late season, insects are more common and problematic. Despite this, regular monitoring is essential to ensure pests are not damaging seedlings, as once damaged, seedling canola plants find it difficult to recover and may require resowing.

Infestations that occur from flowering through to podding can cause large yield losses if pests are not controlled. In the LRZ, pests that commonly affect canola from flowering include diamondback moth (DBM) and aphids. The thresholds noted below are not specific to the LRZ, and some case study participants have commented that in LRZ canola crops the thresholds are actually less because of the reduced yield potential of the crop compared to higher rainfall zones.

Integrated pest management (IPM)

To minimise insecticide resistance developing, growers should use a range of cultural, biological and chemical integrated pest management (IPM) tactics to keep pest numbers low, including:

- regularly monitoring crops for the presence of pests;
- encouraging predators and beneficial insects by limiting the use of broad-spectrum insecticides;
- where possible, controlling pests in the previous pastures or crops;
- implementing early weed control to prevent insect numbers building up;
- adhering to economic spray thresholds;
- considering a border spray where certain insects such as aphids are colonising early in the season;
- rotating insecticides;
- avoiding repeated applications of insecticides from the same group;
- ensuring good spray coverage;
- using seed dressings; and
- considering biological control methods where applicable.

Diamondback moth (DBM)

DBM can be difficult to control with insecticides due to their ability to breed prolifically in warm conditions. Additionally, they are able to rapidly develop resistance to insecticides. If crops are moisture stressed or DBM is detected in-crop prior to flowering, start monitoring with a sweep net. Thresholds for control are (DPIRD, 2017):

- pre-flowering (stressed crop) – 30 or more grubs per 10 sweeps;
- pre-flowering (no stress) – 50 or more grubs per 10 sweeps;
- mid–late flowering (no stress) – 100 or more grubs per 10 sweeps; and
- pod maturation – 200 or more grubs per 10 sweeps.

Drought conditions mobilise nitrogenous compounds in the plants that can stimulate the growth and development of DBM (GRDC, 2009). Therefore, moisture-stressed crops are more susceptible to damage and a lower threshold may be required (GRDC, 2013).

Often, more than two insecticide applications five to seven days apart are required for control, and crops should be monitored after spraying to ensure control has been achieved.

Aphids

Three species attack canola: cabbage aphid, turnip aphid and green peach aphid (GPA). Infestation is common during flowering and pod set, with clusters of aphids commonly seen feeding on flowering heads, upper stems and seed pods. Yield losses in canola of up to 33 per cent have been recorded in WA (Micic et al., 2020). Aphids also have the potential to transmit viruses such as Turnip yellows virus (TuYV) and Cucumber mosaic virus (CMV). TuYV can cause yield losses of 40 per cent in canola.

In the LRZ, drought stress is more likely during flowering and this, coupled with the release of varieties that are more susceptible to aphid colonisation, has increased the risk of feeding damage and yield losses in this zone (Micic et al., 2020). Recent work has shown if GPA infest crops early, seedling damage can occur, which can lead to biomass and yield reductions if numbers are not controlled (Micic et al., 2019). DPIRD trials in Geraldton found that 10 per cent yield loss was incurred for every 1cm of spikelet colonised with cabbage aphids (Harries et al., 2018).

It is important to determine the species present for control purposes. Regular crop monitoring should begin from bud formation to late flowering by checking five different spots within a paddock for the presence of aphids. When more than 20 per cent of plants are infested with cabbage or turnip aphids, insecticide should be applied. However, if crops are already suffering moisture stress, economic yield losses may be higher. Registered products include pirimicarb and sulfoxaflor.

Importantly, GPA have developed resistance to multiple insecticide groups across Australia; therefore, growers should adhere to a resistance management strategy when controlling GPA.

Harvest

Traditionally, the majority of canola in WA is swathed; however, there is an increasing trend to switch to direct harvesting. With lower yielding crops and lower gross margins, swathing is less common in the LRZ than in the medium and high-rainfall zones.

Direct harvesting

Improvements in harvest technology and varieties that are less prone to pod shatter, such as those with PodGuard® technology, have seen increases in direct harvesting. Direct harvesting should commence when pods are dry and rattle when shaken and moisture levels have dropped to eight per cent (Carmody, 2009). Harvest early in the morning to minimise pod shatter.

Featured case study grower findings

Originally, this was planned to be a one-year project; however, with poor seasonal conditions and a very late start to 2019, it was extended with the hope of capturing the experiences of growing canola in the low-rainfall zone in a more 'normal' season in 2020. Unfortunately, while 2019 was a poor year for each of the case studies in this project, 2020 has not been fabulous either. So, when the growers were interviewed in 2020, their key focus was to have flexibility in their cropping programs so they could adjust them as required, depending on the seasonal conditions.

Canola is grown primarily as a weed management tool to keep cereals clean

All the case study growers acknowledge the need to have a break crop in the rotation so they can keep growing clean cereal crops well. One grower also ran sheep, while another used hay as the primary weed control tool but grew canola to reduce the exposure risk of growing hay. Particularly in the eastern wheatbelt, canola was considered the best in terms of a weed clean-up tool with the potential to also generate a profit. However, after a run of tough seasonal conditions, growers are also looking at the possibility of growing other break crops.

In the northern LRZ, two growers chose to grow GT canola to add diversity to their cropping programs. With most cropping programs being sown dry, they felt this was an opportunity to use glyphosate to mix up the herbicides being used.

Canola agronomy

Although there are a number of management strategies that can be used to maximise the potential of a good canola crop, the growers said the biggest factor in growing a profitable canola crop in the LRZ is whether the paddock is under the right rain cloud at the right time. The following management practices were also observed from the growers.

Amelioration

It was noted that as canola responded very well to amelioration practices, such as deep ripping and liming, it made sense to do this before the canola phase.

Time of sowing

All agreed it is ideal to have the canola sown dry and early to beat the hot dry springs, which are a bigger risk than frost. However, as there have been a number of false breaks and long dry spells between sowing, after 2019 most growers will take a more conservative approach and wait for more certainty on the likely seasonal conditions. As one grower said, it is much more preferable to have a late but even germination than an uneven early germination. Sowing into half-wet half-dry conditions should be avoided to maximise germination. It was also noted canola is very susceptible to hot drying winds after sowing when sown shallow.

Herbicide package

The northern growers who grew GT canola acknowledged that while it was more financially risky with the high seed cost, GT canola handles drier conditions better than TT canola. For those who were not reliant on using GT varieties for weed control, the higher seed costs were still a barrier, but there was enthusiasm for moving to GT varieties if the seed costs could be less prohibitive.

To increase flexibility, growers who were using propyzamide indicated they would leave it out in future to give more flexibility in the event of crop failure. The same was also noted with atrazine, with some growers choosing to hold off on applying the first application until the seasonal conditions were more certain.

Seed size

All growers acknowledged the importance of seed size and, if grading seed to grade greater than 2mm.

Late-season pests

While early-season pests are not a major issue for low-rainfall canola growers, late-season pests such as DBM and aphids can be very damaging. One grower decided to spray earlier than the current industry thresholds, which were not developed for the LRZ, as the 'acceptable losses' on current thresholds make up a bigger proportion on a low-yielding crop.

Flexibility is the key to avoid disaster at Mullewa

SNAPSHOT

Growers: Dave, Sheree and John Tropiano

Location: Mullewa, WA

Cropping area: 6900 hectares

Enterprises: Cropping and livestock

2019 growing-season rainfall: 172 millimetres

Soil types: Mixed – gravel, granite loam, red and yellow sand

2020 crop program: 560ha canola (initially), 6150ha wheat, 520ha lupins and 230ha oats

2019 canola varieties: Hyola 404RR, Pioneer® 44Y27, Pioneer® 43Y23

2020 canola varieties: Pioneer® 44Y27, InVigor® 3520

Canola is an important part of Dave Tropiano's rotation on his sandplain farm, 10 kilometres north of Mullewa. Photo: CussonsMedia

Canola has a different fit on the Tropiano family's sandplain property, 10km north of Mullewa, compared to their home farm, 25km south of Mullewa. Either way, they analyse the benefit of growing canola on its own as well as part of the broader rotation.

"Canola does pay its way on its own in average seasons, and in good seasons, phenomenally well, and then in poor seasons, you're looking back at your rotation benefits," Dave Tropiano says.

"On the sandplain farm, it's a key part of the wheat/canola/wheat/lupin rotation, whereas at home, it's grown on a more opportunistic basis.

"If we have a good summer rain, good soil moisture, and we have a paddock that's ready to go with the right soil type, we'll roll the canola into that, to clean it up."

The right soil type for canola on their home farm is granite loams, deeper soils with a good pH. They tend to avoid sowing shallow gravel because it has a poorer pH and limited rooting depth for the canola.

The herbicide strategy also differs between the farms, with the home farm growing TT canola to reduce financial risk, with grass-selective herbicides still working well to control ryegrass, the key weed. On the sandplain, Roundup Ready® varieties are predominantly grown to rotate chemistry away from atrazine, as simazine is being used in the lupin program.

Roundup Ready® canola is tougher than TT

The Tropianos believe, in dry periods, Roundup Ready® plants 'hang on' better and are a lot tougher than TT varieties. While they generally sow the canola at 2 to 3mm with their DBS seeder, they are comfortable sowing slightly deeper with Roundup Ready® if they choose to.

"In 2019 we had some TT planned on the heavier dirt and we canned it because we felt the Roundup Ready® was going to handle the dry spell in between rains better," Dave says.

"Mixing the chemistries and not relying on the same herbicides on this property was worth it and so we ran the risk, whereas at home I wouldn't do that because it's too high risk as we don't have the right soil types."

Big difference in Roundup Ready® varietal maturity

Growing all short-season Roundup Ready® varieties, Dave was surprised in 2019 to see such a difference in maturity between the three Roundup Ready® varieties they grew: Hyola 404RR, 44Y27 and 43Y23.

"The 404 started to flower about 10 days earlier than the 43Y23 and then the 44Y27 was 10 days later again, and we've found the same with podding," Dave says.

At the time, Dave thought 404 would be the highest yielding variety.

"I'd pick it because it's finished but in saying that, we had shedding issues with it before, so our issue is going to be trying to get it all before it sheds."

As it turned out, the 2019 season finished very abruptly, with basically no rain from mid-July.

"The 404, which was quite advanced and pushing on quite quickly, was on some of our better country and that did end up yielding very well at 1.4t/ha," Dave says.

"The one that surprised me was the 44Y27, which was quite slow to come to flower, but came home with a wet sail and was the better yielder at 1.6t/ha on the red sandy loam."

Overall, the canola averaged 0.9t/ha in a tough season with the canola on the heavy red soil suffering the lowest yield as the crop was too big for the moisture available.

Pod shatter in Hyola 404RR

As Dave had predicted earlier in the year, the 404 did end up suffering badly from pod shatter.

"Just before harvest we had a big wind and a lot of the 404 dropped on the ground, and you could see the distinct line between the 404 and the 44Y27 – it was all white in the sun where the 404 was," Dave says.

"So, we pretty much decided that 404 wasn't going back in again because, as quick as it was, when we got that pod shatter, it was a bit devastating."

2020 no canola to harvest

The contrast between the starts to the 2019 and 2020 seasons were stark. In 2019, there was no summer rain on the sandplain farm, until a storm dumped 35mm across 95 per cent of the property. Between 1 and 4mm fell at the home farm.

"We made a decision on 15 April to go, so we just shifted and started seeding the canola on 16 April," Dave says.

"We decided we would finish the sandplain farm off, and then if there was something decent on the horizon towards middle of May, we'd still roll with the canola program at home. However, there was no subsoil moisture and nothing on the horizon, so we just canned the home farm canola program and rolled back to fallow."

"We were very happy with that decision to seed the sandplain farm, although there was a bit of a nervous wait because it was just over six weeks until it rained again on 6 June. Then, from that point on, it's just exploded and pushed away really quickly."

In 2020, the Tropianos received 35mm of rain on 10 February and then 40mm five days later. After starting to sow the sandplain with wheat, rain was forecast and they switched to canola, sowing the whole 560ha program in the first few days of May.

"At the time, we thought we'd got lucky as we got a 12mm rain event over the top of it, but as it turned out, it half-germinated a lot of the seed, and then what did come up probably got droughted and died," Dave explains.

"I was extremely surprised that it didn't all germinate, I thought we'd nailed it, and we were away because there was good subsoil moisture underneath it, as I thought 12mm was enough to get it going.

"For whatever reason, it just didn't – I think it was probably the weather, because it was very hot and windy after sowing and, given the fact we seeded canola extremely shallow, it probably was just enough to take the moisture away from the seed.

"The neighbour next door was sowing wheat at the same time we were sowing our canola and he got 100 per cent strike, so I put it down to the fact the wheat seed was seeded at 30mm, while we were seeding at 0.5mm."

The Tropianos were uncertain if the patchy germination was viable, but then a big wind event buried the seed that had not germinated and killed the few live plants, so the decision was made to spray out the canola and sow wheat.

Future fit

Dave believes canola is still a vital part of the rotation on the sandplain farm, but the way they seed it might be a little different in the future.

"It may be the case, if there is a weather system coming, not putting the canola in until it's 100 per cent certain, or we sow it straight after that rain event," Dave explains.

"I'm a bit more gun-shy in going in without seeing some solid moisture coming, or on the ground already.

"We'll probably stick to Roundup Ready® still, because I like that we can put it in without putting any herbicide down pre-emergent, so if it does fail, we can come back a week later and resow with wheat, like we did this year.

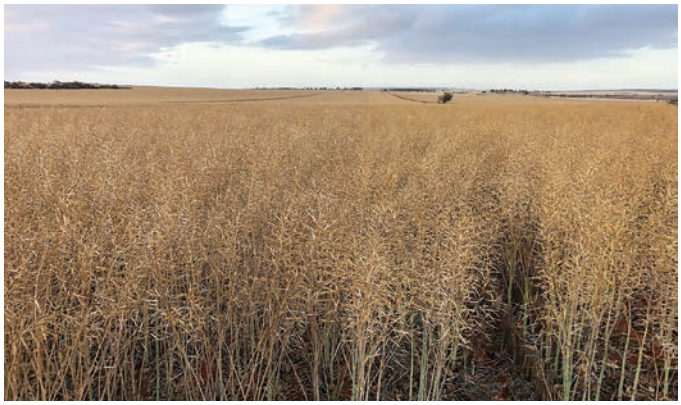
"At the home farm we'll still roll with the same thing, so if we have good summer rain and a good early break, we'll go with canola, but if nothing happens, we just leave it in the shed."

Summary

- Roundup Ready® is tougher than TT canola
- Pioneer® 44Y27 was longer to flower than 404 but out-yielded it
- Shallow sown canola is at risk to hot, drying winds

MORE INFORMATION:
Dave Tropiano, 0429 615 239

Dave Tropiano has found Roundup Ready® varieties hang on better between rain events on their sandplain farm. Photo: CussonsMedia



After being the first variety to mature in 2019, Hyola 404RR (L) shed more and was out-yielded by Pioneer® 44Y27 (R). Photo: Dave Tropiano

Making and breaking the canola rules at East Pithara

SNAPSHOT

Growers: Ben, Kirsten and Robert Strickland

Location: East Pithara, WA

Cropping area: 7500 hectares

Enterprises: Cropping

2019 growing-season rainfall: 161 millimetres

Soil types: Mixed – including wodjil sands, heavy reds, red loams and gravels

2020 crop program: Wheat, barley, canola and lupins

2019 canola varieties: Telfer, ATR Stingray(ⅅ)

2020 canola varioties: InVigor® R 4022P, Hyola 540XC, InVigor ® 3000TR, ATR Stingray(ⅅ), Telfer

Ben Strickland and his family primarily grow canola as a low-cost clean-up tool. Photo: CussonsMedia

Canola is a critical tool to help the Strickland family manage key grass weeds such as ryegrass and brome grass. Ideally, their rotation is a fallow, followed by canola and then two to three years of cereals. However, with challenging starts to the season, the Stricklands can find it difficult to know if canola should still be an important part of their program or whether they should turn to a fallow to control weeds.

"We don't look to canola to be our big earner. It's hopefully better economically than a fallow phase, but still controlling the weeds in the same way that a fallow would," Ben Strickland explains.

To guide their decision-making process, the Stricklands have developed some rules to help make the decision on whether to start sowing canola or not.

"Our rules are basically a guide so that we aren't as stressed about the decision-making at seeding time, when we're trying to make those calls," says Ben.

"We used to run with the guide that if we don't get 15mm of rain by 15 May, extending out to 25mm by the 25th, then the canola program gets left out."

Breaking the rules in 2019

After those key dates passed, the Stricklands decided canola was definitely out of the program in the 2019 season. However, when a four-day forecast suggested there was more than 25mm of rain coming on 6 June, they decided to plant some low-cost canola.

"We had a couple of paddocks that we'd decided were going to be fallow because they were too dirty with grass weeds to put into any cereal crop, and so then we did a really quick gross margin analysis on how cheaply we could put in a canola crop," Ben explains.

"We looked at what sort of yield we would need to cover costs and we ended up working out we could break even and have a clean paddock by doing it quite cheaply with a short-season variety, which was better than running a fallow where we'd be behind anyway.

"If we were to push through and put in a cereal with high inputs of pre-emergents etc, we still wouldn't have control of the weeds. We would have used up moisture and wouldn't have a good result from the cereal.

"So, the easy decision was that cereals aren't going in; the hard one was how do we manage it now?"

Low-cost canola

With the strategy being to grow a low-cost canola, the Stricklands opted to keep their hybrid varieties in the shed and instead sow the short-season OP varieties Telfer and ATR Stingray(ⅅ), which had been treated with insecticide and graded to 2mm.

In trying to make a gross margin out of a late, low-yielding crop, the canola was sown with 15kg/ha of monoammonium phosphate (MAP) and 30kg/ha of urea, and 35L/ha of top-up nitrogen was applied.

"We figured, being deep-ripped two years ago and worked quite well into soft soil, the canola root system would be able to chase phosphorus and potassium through a nice deep-ripped soil," he says.

As it turned out, 2019 was a decile two year for rainfall, with just 161mm for the year.

"We managed 360kg/ha, which was definitely not a profitable crop, but it meant we kept the paddock clean, the harvesters didn't have trouble harvesting, and we had enough to cover most of our variable costs."

Breaking the rules in 2020

With a significant area of fallow paddocks and three big rain events in February totalling between 100mm and 160mm, the Stricklands decided the risk of a poor canola crop under these conditions was low. So, their canola growing rules were again broken and they started dry seeding with hybrids on 22 April. Due to the expected higher potential, the canola was sown with 40kg/ha of MAP, 10kg/ha of muriate of potash (MOP) and 50kg/ha of urea, and then another 10 units of nitrogen was top-dressed when the grass selective was applied.

"We thought we wouldn't get a germination, given we were seeding the hybrid canola shallow into deep-ripped paddocks, which had dried out the topsoil," Ben says.

"And then the season didn't play out the way we wanted, with a number of 3mm and 4mm rains that didn't meet up with the subsoil moisture, giving us about a 20 or 25 per cent germination, which was just the worst possible scenario for that canola.

"The seeds wet up, swelled, a few of them germinated, and the majority of them we thought had died.

"So, with lots of little rain events, we thought we were stuck with six plants per square metre on average, varying between one plant per square metre, and the better areas were 15 or more."

In addition, the Stricklands received some very big wind events that Ben estimates removed between 10 and 15 per cent of their canola. The affected areas were sprayed out and resowed with barley. However, as propyzamide had been applied upfront with the canola, they were very nervous whether the barley would germinate and provide enough soil cover.

"It was a really awkward start for canola. I thought no rain was the worst result for canola, but I've changed my mind – lots of little rains are definitely the worst result for canola," Ben says.

With good rains in early August, he reported that the canola had completely transformed with a lot more plants present and it was far more robust that he thought was possible.

Trialling hybrids in 2020

With the potential risk in growing canola reduced, Ben thought the conditions after the February rains warranted trialling hybrid varieties in conjunction with their stalwarts, Telfer and ATR Stingray(1). They had some GM varieties on hand, InVigor® R 4022P and InVigor® 3000TR, and purchased some Hyola 540XC for a paddock that had a previous history of imidazolinone (IMI) use.

"We thought with old season GM seed on hand we shouldn't leave it for too much longer before putting it in the ground, so that was another reason that pushed us towards getting it all in the ground dry," Ben says.

With the hybrids planted about 50km apart from the OP varieties, which had received slightly more rain than the hybrids, he says it is very difficult to make a fair comparison between the two.

"The hybrids I think are just going to be too much risk for us because if such a nice set-up still leaves us wondering if it's justified, then anything less than an ideal set-up to the season probably means we can't really afford the extra risk."

Ben is hopeful, however, that with some companies beginning to offer varieties with an initial lower seed cost and a high EPR, such as HyTTec® Triumph and HyTTec® Trident, the financial risk of growing canola might be reduced, making it a much better fit for low-rainfall areas.

"I have just been told by the local seed merchant this is an option, and I quickly did some back-of-the-envelope sums and that actually looked like it should work, given the hybrid TT varieties still seemed to have at least a similar amount of potential, if not more than the current Roundup Ready® hybrids," Ben says.

Back to the rules – with an asterisk

After breaking their own canola rules for the past two seasons, Ben thinks they will return to their original rule, unless there is an exceptional circumstance where the risks of failure have been reduced.

"We just need to know how big that opening rain is, because I think canola is very resilient. It's a tough plant, but it's very vulnerable at those early stages, needing 10 or 15mm to get a guaranteed germination for it to be able to be a resilient plant for the rest of the season," he says.

"We won't sow hybrids as aggressively as we have in 2020 ever again and, instead, we'll probably pick on the best set-up paddocks, which will probably still be sown dry, but I wouldn't want to sow more than half the planned canola program dry.

"We will then leave the rest and see how big, and when, that opening rain is, and paddocks sown after that rain will inevitably yield less most of the years, but we'll be just aiming to do a low-cost clean-up instead."

Summary

- Canola is grown as a low-cost clean-up tool
- Sow canola if 15mm of rain has been received by 15 April
- Hybrids might have a greater fit if initial seed costs can be reduced

MORE INFORMATION:

Ben Strickland, stricklands@wn.com.au

Low-cost Telfer (top) sown on 15 June 2020 compared to the more expensive InVigor® R 4022P (bottom) that was sown dry on 22 April 2020, but partially germinated thanks to a number of rains less than 5mm: Photos: Ben Strickland

Growing glyphosate-tolerant canola to add herbicide diversity at Ballidu

SNAPSHOT

Growers: Corey, Olivia, Phil and Sue Mincherton

Location: Ballidu, WA

Cropping area: 5500 hectares

Enterprises: Cropping

2019 growing-season rainfall: 127 millimetres (normally 230mm)

Soil types: Mixed – including lake loams, sand over gravel, Sunday country, conglomerate

2020 crops: Wheat, barley, canola and lupins

2019 canola varieties: Pioneer® 43Y23 RR, Pioneer® 43Y29 RR and DG 408RR

2020 canola varieties: Pioneer® 43Y23 RR, Pioneer® 43Y29 RR and DG 408RR

Corey Mincherton grows glyphosate-tolerant canola to add herbicide diversity to his predominantly cereal program. Photo: CussonsMedia

Corey Mincherton and his family grow canola on their eastern and western Ballidu blocks because, as Corey says, "they have to". With a one-in-four rotation with cereals, between 1000 and 1400ha of GM canola is grown as a break crop and to help manage ryegrass and radish.

"A standard rotation is one season of canola, two of wheat, one of barley and then back to canola again, because if I stretch another cereal, I'll get hurt unfortunately," Corey explains.

The Minchertons have been growing glyphosate-tolerant (GT) canola for the last 10 years because Corey believes he has some clethodim resistance issues after many years of growing lupins, and atrazine and simazine were not working as well as they should have. After initially starting with Hyola 404RR, in 2019 and 2020 they grew 43Y23 RR, 43Y29 RR and DG 408RR.

"The 43Y23 offers good yield and now the 29 is supposed to offer oil and yield, and the DG 408 is just a slightly smaller growing window than the 43 – but there'll be a week in it between the three varieties," Corey says.

Canola is usually sown dry in mid-April at between 1.2 and 1.8kg/ha at 3 to 12mm deep onto paddocks that have had 2t/ha lime and 0.5t/ha of gypsum applied before seeding. The lime and gypsum are then either incorporated by seeding or with his older ripper, down to 350 to 400mm. 50kg/ha of monoammonium phosphate (MAP)/muriate of potash (MOP) and 50L/ha of Flexi-N are applied at seeding, and then conditions are monitored to determine the rates and timing of follow-up applications of nitrogen.

Tough canola seasons

Corey has generally considered the benefit of growing canola over two years, but when conditions are not 'average', he does question his canola strategy.

"In 2016 canola was awesome, 2017 it was a total flop, 2018 was average and 2019 was a flop," he says.

In 2019, the Minchertons began sowing their canola program on 25 April, before receiving 6mm of rain in late May, which germinated some of their western block canola, although some also perished. On 9 June they received their opening rains of 20mm. Corey says while the germination was patchy, it was not worth reseeding because it was too late.

Unfortunately, the rain did not continue and spring was hot and dry, meaning when combined with high diamondback moth and budworm pressure, their eastern blocks yielded 0.3 to 0.4t/ha and their western block 0.6 to 0.7t/ha.

"The canola yielded about a quarter of the wheat because we had that hot September that knocked out the canola," Corey says.

"If the canola had germinated early and was flowering by July when it was cold, then it'd be a different story."

Summer rain in 2020

After the tough financial result in 2019, Corey planned not to sow canola and lupins in 2020, but after about 130mm of summer rain at their eastern blocks, they sowed 800ha of primarily 43Y23 RR and 43Y29 RR in the last week or so of April.

"Out east we went in with moisture at depth, so I seeded it an inch deep because I knew it wasn't going to rain for a

few weeks, and at one block of 400ha probably 95 per cent germinated early and at the other 400ha block, probably 50 per cent did," Corey says.

"We had three different germinations; we had early sown germinated, germinated on the 7mm we had in early May, and then germinated at the end of May.

"It was nerve-wracking, but we would sow deep again if it was a week earlier because where it was wet, it was out of the ground in three days."

Waiting for a break

Trying to minimise some of the financial risk in growing canola, Corey is now considering a number of strategies, including delaying his canola sowing.

"I'm almost toying with the idea of not putting canola in until there's a break, because if we get 10mm, it's fine, but if it's only 5mm, it's not fine.

"Basically, you sit there and when there's 25mm coming, let's go hard for three days and then two days after it's rained, we finish.

"That way, the dry stuff has got the 25mm on it and the wet stuff's gone into the moisture, and we're away."

If there has been no summer rain and the opening break is deemed too late for canola, Corey is considering waiting and applying a knockdown herbicide to that paddock and sowing it at the end of his program, knowing that he has managed to control some weeds prior to the crop germinating.

"Say for argument's sake it rained on 10 May and I've had no summer rain, I'm not putting canola in, so I'll probably leave it until last and seed it, knowing I've cleaned it up with a knockdown," Corey says.

"If it's a late break and there's no knockdown involved, I'll probably leave at least half of it out and then reassess."

Dropping propyzamide out

Traditionally, Corey has applied 1L/ha of propyzamide as a pre-emergent in canola and used Sakura® and Boxer Gold® elsewhere in the program to keep mixing up his herbicide use. However, as propyzamide is not registered for use in cereals, it can limit his ability to change crops in the event of a poor canola establishment.

"I'll probably go away from using that in canola and I'm thinking I'll go a high rate of trifluralin, only because if anything happens you can instead put in wheat or barley," Corey says.

"People say there's no issue with propyzamide, but then there's issues where the wheat and barley gets to three or four leaves and then just dies. It's a hard one."

Summary

- GT varieties add herbicide diversity
- Wait for a break to grow canola to minimise financial risk
- Dropping out propyzamide increases flexibility

MORE INFORMATION:
Corey Mincherton, 0429 988 730

Pioneer® 43Y23 RR, that was sown on 25 April 2020 and received 12mm of rain in the first week of May. Photo: Corey Mincherton

Pioneer® 43Y29 RR, that was sown on 20 April 2020 with some canola germinating early, but the majority germinating on 23 May 2020 with the opening rains. Photo: Corey Mincherton

Minimising the risk of false breaks at Korbelka

SNAPSHOT

Growers: Paddy, Annette and Sam Hooper

Location: Korbelka, WA

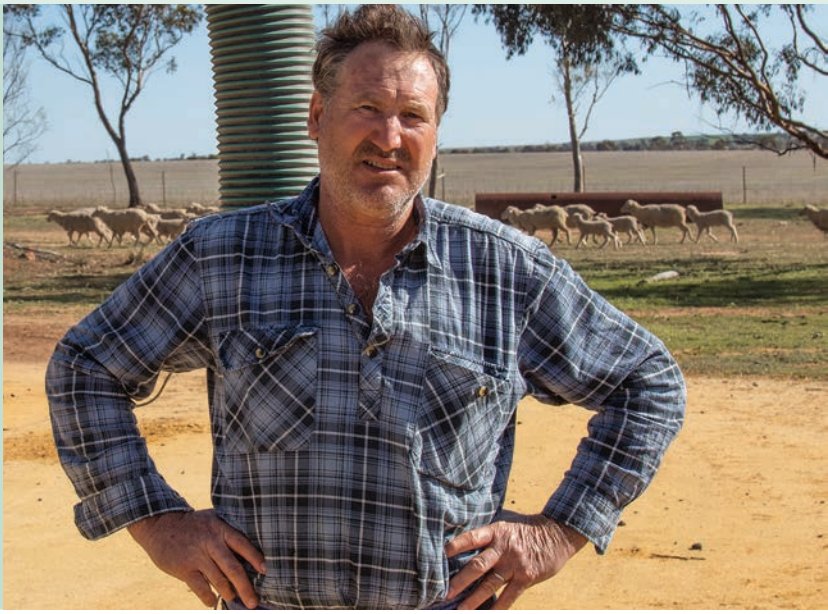
Enterprises: Cropping and livestock

2019 growing-season rainfall: 120 millimetres

Soil types: Mixed with heavy, red clay to light, sandy gravels, not much medium soil

2019 canola varieties: ATR Bonito(ⅰ), Pioneer® 43Y23 and InVigor® R 3520

2020 canola varieties: InVigor® R 3520



Sheep have an important fit on lighter soils on Paddy Hooper's property, where they are in a year-in, year-out rotation. Canola is currently the best break crop option on their continuous cropping country, but consistently growing a profitable canola crop is challenging when rainfall is limiting. Photo: CussonsMedia

Sheep provide a profitable break on the Hooper family's lighter country, where they run a mostly year-in, year-out rotation on paddocks that have historically been continuously cropped to manage resistance issues. However, finding the optimal grass weed management tool to control ryegrass, brome grass and barley grass on heavier continuous cropping country is a significant challenge, particularly with some of the seasonal conditions over the past few years.

"We need a one-in-three-year break crop, and we're trying to put a canola crop in there," Paddy Hooper says.

"Canola was probably the best way of making a dollar and having a clean-up, but we have taken on extra country in the last few years and that has been more heavy than light, so we've grown canola on it – but I'm not sure it's the best fit. So, we're going back and playing with lupins a bit on the medium soil, and we're playing with peas a bit on our heavier country."

If canola establishes in a reasonable growing season, it is the most profitable of the break crops. But, as Paddy says, with frost and dry, hot finishes, this hasn't been the case the last few seasons.

"Our net margins are lower on peas and lupins than canola and on our five-year average, our canola is below any cereal that we grow, and by a bit.

"The added bonus of the peas and lupins is the nitrogen fixing and the grazing value. Canola's in and out for a clean-up and if you had something better to clean up, with a bit less risk, we'd probably do it."

But it is not about making the best margin on a one-year basis for the Hoopers. They are taking a longer term view with the aim of having a farm with a low weed burden. However, they are trying to minimise the years when canola does not financially perform.

False starts

In the last few years, false breaks of less than 10mm when there is no subsoil moisture has had the biggest impact on the Hooper's crop establishment.

"We've had canola in the ground and got a germination, and just had no follow-up rain, and then we've lost more than 50 per cent – it was the big holes left with nothing on that hurt," Paddy says.

"Ideally, you want a 10mm-plus event and then you'd want another one within 10 days to follow it up. That's probably the secret, because when you have them spread out any longer than that, you're always battling a bit to keep plant numbers."

Reduce program as season gets later with no moisture

To manage the financial risk of a poor canola season, the Hoopers reduce planned canola hectares if seasonal conditions are not favourable. In 2019, they had planned about 1100ha of canola and then, as the season got later and with no subsoil moisture, they dropped 220ha from the program.

"The 200-odd hectares we pulled out early was lupin stubble with no subsoil moisture, and when you look at net margins and you have got low to no subsoil moisture, we thought we'd make more out of a cereal crop on that country with a late break than we probably would with canola, and it probably didn't need a second clean up," Paddy says.

"If it had rained earlier, we would have been happy to grow canola on it, but you've just got to make some decisions and where we are, the finishes to seasons are normally pretty tough."

Unfortunately, the finish to the 2019 season was exactly that, with virtually no significant rain after the middle of July and very warm conditions through the second half of August and early September. This resulted in an average yield of about 0.35t/ha, well below the 1t/ha Paddy believes is required for canola to pay its way.

Changing herbicide strategy

The Hoopers have traditionally mainly grown TT canola, often choosing to leave the first application of atrazine out to provide increased options for reseeding in the event of a poor canola germination. After initially reducing their 2019 program by 220ha, a poor germination of ATR Bonito(ϕ) for the second year in a row meant 400ha was resown to wheat.

"All the canola that remained in 2019 was Roundup Ready®, and it's mainly always been TT only because of the price of the seed," Sam Hooper explains.

Again, after planning to sow about 1000ha of canola in 2020, with 77mm in February but no follow-up rain, the canola program was reduced to 250ha and sown dry. After growing both 43Y23 and InVigor® R 3520 in 2019, the Hoopers found the 3520 yielded slightly better than the 43Y23 and had a cheaper seed cost. So, in 2020 they shifted their canola strategy to a 100 per cent glyphosate-tolerant (GT) canola program because of the performance of the 3520 and the option to use glyphosate in-crop to mix up their herbicide use.

With a forecast of 5 to 10mm in a matter of hours, the 3520 was sown on 17 April, shallow at 2kg/ha with 35 to 40kg/ha of MAP and 40 g/ha of urea. Prior to sowing, 120 to 150kg/ha of ammonium sulfate had been spread. Unfortunately, only 2mm was received and nothing germinated until 15mm was recorded on 25 May.

"Obviously, the canola looked a bit dirty with grass early on, but if you look now you wouldn't know that there hadn't been a pre-em applied at all," Sam says.

"That's definitely a positive strategy with the Roundup Ready®, whereas if you are growing more pulses, you are relying on clethodim to do a job in peas and lupins, the Roundup Ready® splits your chemistry up really.

"We're using less and less glyphosate actually in the cereals in the system these days because we're doing more and more dry sowing, so it's a good opportunity to use Roundup on some of our winter weeds."

Future canola plans

For Paddy and Sam, growing canola successfully is all about getting the rain at the right time because, for dryland farmers, a certain amount of rain is required to get an average yield or better. Therefore, every year they will drop or add canola hectares depending on the conditions. They also plan to continue growing peas and lupins to evaluate their fit.

"On average we aim for 1100 or 1200ha of canola. Then, if there is no summer rain and no subsoil moisture, we'd drop our program back by 50 per cent, and maybe go up 50 per cent if it does rain," Paddy says.

"I think if we get that reasonable April rain and we get a chance to establish canola, we'll quite comfortably sow 1500ha.

"If you get it established, you're halfway there, and then you get a rain in September to finish it off; but unfortunately, if you don't get that spring rain it doesn't matter how well it's established."

Summary

- Avoiding applying first triazine application at sowing increases reseeding options in poor starts
- Roundup Ready® canola is an opportunity to mix up herbicide use
- Match canola program to seasonal conditions

MORE INFORMATION:

Paddy Hooper, 0429 469 045

With a forecast of 5 to 10mm in a matter of hours, InVigor® R 3520 was sown on the 17 April 2020, shallow at two kilograms per hectare, with 35 to 40kg/ha of MAP and 40kg/ha of urea. Unfortunately, only 2mm was received and nothing germinated until 15mm was recorded on the 25 May. Roundup Ready® canola was sown in 2020 because of its performance in 2019 and to mix up herbicide use.

Photo: Paddy Hooper

Fortune favours the brave in Merredin

SNAPSHOT

Growers: Brad and Elizabeth Atkinson

Location: South-east Merredin and south-west Bodallin, WA

Enterprises: Cropping

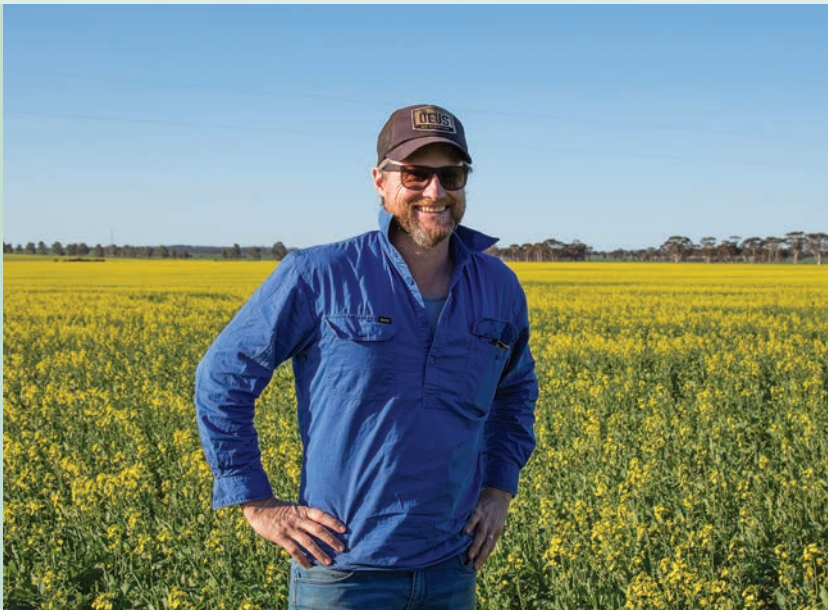
2019 growing-season rainfall: 180 millimetres

Soil types: Mixed medium to light

2020 crops grown: Wheat, export oaten hay and canola

2019 canola variety: ATR Bonito(ↀ)

2020 canola variety: ATR Bonito(ↀ)



Brad Atkinson is a firm believer that if you plan to grow canola, it is for a reason, so stick to it as changing crops in a tough year does not generally mean an increase in profit. Photo: CussonsMedia

Growing approximately 3000ha of oaten hay for export is a significant part of Brad Atkinson's cropping program, which he considers is his most useful grass clean-up tool, but it is also his riskiest crop. Rather than fallow, canola is used where hay is not suitable or if the hay area is deemed too large, as a grass weed management tool, and to provide a disease break from the cereals on his Merredin and Bodallin farms.

"I've heard people are getting good results from fallow, but I don't know that it pays its way enough for me," Brad Atkinson explains.

"I really want to have a profitable crop that cleans and produces. Canola may not be as profitable as some of the others, but I don't want to do anything for nothing.

"I want a profit out of every hectare ideally, as I'm not thinking, 'We'll do this for next year' - I'm doing it for this year."

Large seed ATR Bonito(ↀ) is the way to go

With glyphosate-tolerant (GT) hybrids being seen as too great a risk, Brad is happy to stick with growing ATR Bonito(ↀ), which is sown at between 2.2 and 2.5kg/ha after being graded to 2mm.

"The GM seed's too expensive, there's a penalty when you sell it, I'm not hearing huge yield differences and I haven't pushed clethodim too hard in the past, so it still works for us," Brad says.

"We use plenty of glyphosate on our hay country that we're spraying out, so for us, I'm happy with the TT, it's a lower-risk canola crop."

Grading seed to greater than 2mm has made a big difference to crop establishment after years of poor germinations after buying seed from fellow farmers and noticing his establishment compared poorly with the hybrids.

"I thought, have they got better germination because it's GM seed, or is it just because it's good seed?"

"So, I went out and spent the money and bought fresh seed from Nuseed, even though it was ATR Bonito(ↀ), and we got an excellent germination.

"I thought, we've got a good base to start from now, we'll clean that to greater than 2mm and go with that and I've not looked back."

Pre-emergent herbicides remain constant

The last two seasons have seen canola sown dry in April and not emerging until opening rains in early June 2019 and late May 2020. However, Brad is not tempted to hold off on applying the first 1.1kg/ha of atrazine as a pre-emergent with a maximum rate of trifluralin to protect against a poor start to the season and to provide flexibility in his cropping program.

"We don't really modify our plans, so we plan to plant canola dry, and if it's wet, well, great," he says. "If it's half-wet, half-dry, we might plant oats before we plant canola, until we get the conditions right."

After reflecting on another hot and dry spring at the end of 2019, Brad believes that switching out of canola into a cereal would not have delivered a better result.

"I think we will continue to put the atrazine upfront because a change in the crop wouldn't have necessarily yielded us any more money.

"Where we got 600kg/ha of canola, through the fence we got 1.2t/ha of wheat, and as the canola is worth roughly twice as much as the wheat, especially when you take in the lack of freight costs with the canola compared to wheat – all that considered – it returned the same farm gate value as the wheat.

"So, I don't look back and think 'I wish I'd planted wheat or barley'. In fact, I can rarely think of a time where I wish I hadn't planted the canola, so we're committing to that being canola, like someone commits to fallow or any other crop."

Canola responds to deep ripping and lime

After conducting a few deep ripping and lime trials and seeing the improvement in his cereal crops, in 2020 all of the Atkinson's canola program was deep ripped dry to about 450mm with a 12m Agrowplow and had 1.5t/ha of crushed limestone applied.

"In wheat, we nearly guarantee ourselves half a tonne increase in yield, and in hay we've had up to a 2t difference between deep-ripped and non-deep-ripped," Brad says.

"In the canola it's hard to say what it could've been because we've had a nasty frost on our best crops, but I'm estimating a 250kg/ha difference.

"I'd seen that the canola was going to respond to the deep ripping, particularly if it was going to be a drier finish again; we would have more water to fill pods because we'd had good success on deep-ripped country in the past, but we realised we needed less acidity as well."

A rubber-tyred roller follows the Agrowplow and if the paddock is cloddy, an Ajust-a-bar is used to break up the clods. Their ATR Bonito(ↀ) canola is sown with a Bourgault Paralink with Root Boots, which Brad believes accurately places the seed 15mm deep.

"I don't chase the moisture, even if it's down there, because if you don't get it and you have to wait for the next rain, it's too deep to come up, and if you get only a little rain, it'll rot," Brad explains.

Midwest fronts with canola augers

After trying a range of harvesting set-ups, the Atkinsons use 18m (60-foot) Midwest fronts with a canola auger, which Brad believes is the best way they have harvested their canola.

"The 60-foot front with the canola auger feeds really well when you set the spiral up in the correct spot and we can harvest all day long at 5.5 to 6km/h," he says.

"It is the most economical way to do it, because those with a 40-foot front are still doing 5.5 to 6km/h, and none of us are overloading our harvesters – it's purely a feed situation.

"So, we have the least amount of shatter at the knife, as we've got a knife sweep-in with the Midwest, as opposed to the stone dam that's on other fronts, which creates a lot of yield loss."

Do not rush to reseed

A key lesson learnt by Brad after two seasons of late-emerging canola is to not write off the crop and rush to reseed it, if it has not germinated until June. In 2020, they had about 60mm in March followed by 20mm on 1 April, but Brad decided it was too early to sow the canola and instead chose to wait.

"We thought we might get a five to 10mm rain event that would bring it all up, but we didn't," he says.

"We ended up getting only 5mm for the next month and a half, and it didn't come up until June.

"Germination looked terrible in the beginning, with just creek lines and a couple of small patches through the paddock that germinated; the rest didn't.

"We were searching for the seed, thinking that it had just swollen and burst as we couldn't find any seed.

"But now when we look out there, we've got canola everywhere and it was just lacking enough rain to get going."

Summary

- Canola is the secondary weed control tool to hay
- Large seeded ATR Bonito(ↀ) performs well
- Pre-emergent herbicides remain constant

MORE INFORMATION:
Brad Atkinson, 0407 411 577

Brad Atkinson has seen a significant improvement in his ATR Bonito(ↀ) germination after grading seed to a minimum of two millimetres.

Photo: CussonsMedia

Amelioration has given canola more potential for Warakirri

SNAPSHOT

Growers: Tony Murfit, 'Mawarra' Warakirri Asset Management

Location: Merredin, WA

Cropping area: 20,000 hectares

Enterprises: Cropping

2019 growing-season rainfall: 130 to 180 millimetres

Soil types: Mixed – loamy clay to acidic sandplain

2020 crop program: Canola, wheat, barley, chickpeas, lupins and fallow

2019 canola varieties: ATR Bonito(ϕ), Pioneer® 43Y92 CL

2020 canola varieties: ATR Bonito(ϕ), HyTTec® Trophy, HyTTec® Trident, Pioneer® 43Y92 CL, Pioneer® 44Y27 RR and Pioneer® 43Y29 RR

'Mawarra' farm manager Tony Murfit in ATR Bonito(ϕ) that was sown on 5 April 2019 after 23 millimetres on 2 to 3 April and then no further rain for nine weeks. The last rain for 2019 was 2 to 3mm in September and the crop yielded 1.4 tonnes per hectare. Photo: CussonsMedia

Tony Murfit, Warakirri 'Mawarra' farm manager, had a rule to never grow canola after a cereal. However, he has relented now to either sowing canola after a 'flood' in March or a long fallow to ensure there is enough moisture at depth to produce a successful canola crop. They are taking that a step further now as most of their canola is sown into fallow paddocks that have been ameliorated the previous winter, because they have found they get the biggest response to soil amelioration in canola.

"While we have sown canola into fallow paddocks that haven't been ameliorated, at the moment we're targeting the paddocks that need amelioration, and canola is the one we go to because it's got the best return and is the most responsive to pH change in the first year of lime," Tony explains.

With the aim of having surface pH levels above five, lime and gypsum are spread over summer in the paddocks that need amelioration with variable rates of coastal limesand (2t/ha budgeted), and a blanket application of 1t/ha of gypsum. After seeding, those fallow paddocks are ploughed to around 250 to 300mm with a Plozza plough (with a roller behind to reduce the fluffiness of the soil) and then a cover crop is spread to reduce the erosion risk and provide some shelter for the following season's newly emerging canola crop. The paddock is then deep-ripped to 600mm. A double-knock is applied in spring to stop weed set of the key weeds ryegrass and radish. From there the paddock will be camera-sprayed to keep those paddocks weed-free until seeding the following year.

Heat stress is worse than frost

Usually making up around 20 per cent of the cropping program, canola is a very important crop at 'Mawarra', particularly for managing ryegrass, and if the start to the season is kind, it can be their highest gross margin crop. Tony believes the ability to sow canola early is critical in the eastern wheatbelt because of the impact of heat stress later in the season.

"I think heat out here is far worse than frost because heat stress will take all the plant's flowers. A very, very severe frost will take a big chunk of the crop, but most frosts take bits and pieces, whereas heat will come through and you'll look out there the next day and the flowers are gone. I think going early is still going to be key with canola, out here in this part of the world where we don't get the kind, soft finishes."

Being flexible

Tony is also very keen to avoid sowing canola into half-wet, half-dry conditions, something he was faced with in 2020. Their north-eastern block was fallowed ready for canola in 2020 but after a very dry end to 2019 (2 to 3mm in September was their last rain event) and some good summer rain in February, they made the decision that there wasn't enough subsoil moisture for canola, so they planned to switch it into a cereal. Then they had a 20 to 30mm thunderstorm over the block at the end of March and made the decision they were actually good to go with canola, so it was sown at their usual depth of 5mm.

After completing the canola program at the north-eastern block, they made the decision to stop seeding and wait for two weeks for the soil to completely dry out. This was to avoid sowing canola into half-wet, half-dry conditions.

"After that early opportunity, we needed to pull up and wait for two weeks and let the soils dry out completely on the surface because on the fallows there is moisture at depth, but it's too far down for canola," Tony says.

"So, we waited and put an elbow canola sowing boot on, which squirts seed out the back and just places it all very, very shallow and uniform."

The approach proved to be a good one, as the canola had an even strike following 15 to 16mm of rain on 6 May.

"I think getting a late strike, but an even strike, is better than having earlier, but poorer establishment, which then just makes management really difficult," Tony says.

Trialling varieties

After analysing National Variety Trials results conducted on the farm and with their own larger trials, in 2020 'Marwarra' is moving away from ATR Bonito⁽ᴰ⁾ being the mainstay of the canola program and is now growing triazine-tolerant (TT) Clearfield canola and glyphosate-tolerant (GT) canola.

"We have added Trophy and Trident as the TT hybrids that we are looking at stepping it up to from ATR Bonito⁽ᴰ⁾," Tony says.

"They are the ones with the more vigour and the Trophy did really well in our trials, stacked up against the Roundup Ready® and the Clearfield last year, so we've got some of that in the paddock this year. The trial winner last year was the Roundup Ready® 44Y27 and we've done probably the bulk of the canola with that this year.

"Another one that did really well was the 43Y29, which turns out to have a longer filling pod time, it continues to flower and fill, so it went into the late March opportunity."

Tony acknowledges there is a big seed cost in the GT hybrids, but he believes it is a useful weed control tool to have, and so will continue to evaluate their fit in their program.

Spraying early with late-season pests

While early season pests such as redlegged earth mites are not much of a problem at 'Mawarra', Tony believes late-season pests, such as aphids, need to be controlled earlier than current thresholds indicate.

"I think what has been seen as an accepted level in the past is not really acceptable, as the losses we can get on a low-yielding crop is a bigger percentage of our crop.

"When we've got an eastern wheatbelt plant and you're waiting for those numbers – I think the ratios are wrong, so we're lowering our threshold numbers to protect our crop," Tony says.

Bigger bucket for nitrogen decisions

Another bonus of the fallow and amelioration program prior to canola is a new-found confidence to extend the nitrogen application window, knowing that the amelioration work has given the canola a 'bigger bucket' to draw from.

"After the fallow we have quite good numbers of nitrogen in the soil and we thought we were right with those levels, but we've been doing nutrition trials after amelioration in the canola and have found there's plenty more to be had by pumping more nitrogen into the crop," Tony says.

Nitrogen rates are based on starting soil levels of nitrogen, rainfall and soil type. In 2020, 35kg/ha of monoammonium phosphate (MAP) and 30L/ha of urea ammonium nitrate (UAN) was applied at seeding before coming back with 40kg/ha of urea pre-flowering and then 40L/ha of UAN at between 25 and 35 per cent flowering.

"If we'd had more rain, I'm very confident to go later but we're only getting 10 to 20mm events, not the massive 40 to 50mm events," Tony says.

"If we'd had something like that happen, we probably would've launched into it again as we've watched it and measured it all the way through, so we knew where we're at. Whether we're going hard enough with our new 'bucket capacity', I don't know – that's probably something that we'll keep exploring."

Canola following pulses

DPIRD's Bob French is leading a pulse trial at 'Mawarra', examining the performance of different pulses across three different soil types that have been ameliorated. A canola plot has also been included in the trial, giving Tony the opportunity to compare how pulses might be an alternative in the 'Mawarra' rotation.

"We're thinking if we went a fallow and then a legume-type crop and had some moisture left behind, on a decile five start, we would probably be right with canola, which would take a bit of that risk out," Tony says.

"In 2020 the canola after the lentil really came home very strong, it actually looked better than the canola on the fallow but the harvest yield data tells the story. We're in a low-rainfall zone, but most of the guys that are following their legumes with canola are getting a sensational crop, they're getting a very healthy crop and by the time they swing around to a cereal, we've got an exceptionally healthy cereal plant.

"That's where we want to be, we want to be able to go into the cereals, with no in-crop grass sprays and be able to crop for three years until we want to pull out. We don't want to be forced out in one year with ryegrass problems, so I see canola still having a big place."

Summary

- Canola crops respond best to amelioration
- Sow early to minimise heat stress in spring
- A late but even germination is better than an uneven early germination

MORE INFORMATION:

Tony Murfit, 0427 447 063

Go to the GRDC YouTube channel to see and hear more from Tony: 'Golden rules for growing canola in WA low-rainfall zones' (https://youtu.be/YGGTtiE4Zsg)

Canola currently follows fallow paddocks that have been ameliorated with limesand at about two tonnes per hectare, gypsum at 1t/ha and deep-ripped with a Plozza plough. On the left is not deep-ripped, and to the right is where the ripping started.

Photo: CussonsMedia

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