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CANOLA

SECTION A

INTRODUCTION

CROP OVERVIEW

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Introduction

A.1 Crop overview

Western Australia (WA) is the major canola-growing state in Australia, producing about 40% of the nation's 2.7 million tonnes each year.

The majority of WA canola is exported, generating ~\$0.6 billion for the state's economy each year. The Netherlands, Belgium, Germany and Japan are WA's largest export canola markets.

Canola from WA is renowned for its high oil content, with the state consistently achieving higher oil contents than the rest of the nation.¹

A.1.1 History of canola

Canola refers to the seed and oil that is produced by several cultivars of the rape plant, generally cultivars of either rapeseed (*Brassica napus* L.) or field mustard/turnip rape (*Brassica rapa* subsp. *oleifera*, syn. *B. campestris* L.).²

Rapeseed oil was produced in the 19th Century as a source of a lubricant for steam engines; however, it was less useful as food for animals or humans because of high levels of erucic acid and glucosinolates, chemical compounds that significantly lower the nutritional value of rapeseed for animal feed.

Canola was developed in Canada in the early 1970s by traditional plant-breeding techniques to reduce significantly the levels of erucic acid and glucosinolates that were found in the parent rapeseed plant. The name 'canola' is a contraction of 'Canadian' and 'ola' (meaning oil).³

In the 1970s, intensive breeding programs in several countries including Australia produced high-quality varieties that were significantly lower in the two toxicants. Varieties termed 'canola' must meet specific standards on the levels of erucic acid and glucosinolates. They must yield oil low in erucic acid (<2%) and meal low in glucosinolates (total glucosinolates 30 µmol/g toasted oil-free meal)

¹ DAFWA. Canola. Department of Agriculture and Food Western Australia, <https://www.agric.wa.gov.au/crops/grains/canola>

² Canola. Wikipedia, <http://en.wikipedia.org/wiki/Canola>

³ CanolaInfo (2015) Where does canola come from? CanolaInfo, <http://www.canola.info/canola/where.php>

(CODEX International Food Standards 1999), and are often referred to as 'double low' or 'double zero' varieties.⁴

Australian canola typically contains <math><10\ \mu\text{mol/g}</math> of glucosinolates, 43–45% oil, and 38–40% protein in oil-free meal.⁵

Canola now dominates the consumption markets for oil and meal (Figure 1). Production of high erucic acid rapeseed is confined to production under contract for specific industrial uses, including environmentally friendly lubricants.⁶

In addition to varieties from the traditional *B. napus* and *B. rapa* species, cross-breeding of multiple lines of *B. juncea* has enabled this mustard variety to be classified as a canola-type variety by lowering both erucic acid and glucosinolates to the market standards.⁷



Figure 1: Canola is now a major oilseed industry, providing national economic benefits in employment, processing, manufacturing and exports.

A.1.2 Canola in Australia

Rapeseed was first trialed in Australia in the early 1960s and grown commercially in 1969, following the introduction of wheat delivery quotas. The first commercial seed, of the variety Target, was imported from Canada in 1967 by Meggitt Ltd.

⁴ OGTR (2002) The biology and ecology of canola (*Brassica napus*). Office of the Gene Technology Regulator, [http://www.ogtr.gov.au/internet/ogtr/publishing.nsf/content/canola-3/\\$FILE/brassica.pdf](http://www.ogtr.gov.au/internet/ogtr/publishing.nsf/content/canola-3/$FILE/brassica.pdf)

⁵ AEGIC. Australian grain note: canola. Australian Export Grains Innovation Centre, http://www.australianoilseeds.com/oilseeds_industry/quality_of_australian_canola

⁶ CanolaInfo (2015) Where does canola come from? <http://www.canolainfo.org/canola/where.php>

⁷ Canola. Wikipedia, <http://en.wikipedia.org/wiki/Canola>

Early varieties were not well adapted to Australian conditions, being Canadian in origin. Canadian plant breeders had developed varieties much lower in erucic acid than Target and Arlo, but they were also lower in yield, so never became popular in Australia. For the same reason, the first 'double low' varieties were not widely grown in Australia. The varieties available were also quite susceptible to blackleg, and farmers suffered increased disease losses. The growth of the industry was being limited by a lack of suitable varieties.

The first rapeseed-breeding program in Australia was set up in Victoria in 1970, followed by WA and New South Wales in 1973. Their initial objectives were to develop varieties that were blackleg-resistant and low in erucic acid and glucosinolates while maintaining or increasing yields. Blackleg became a major problem in the early 1970s, and the disease was soon widespread. In WA, where the disease was most severe, yield losses of up to 80% resulted in plantings crashing from 49,000 ha in 1972 to 3,200 ha in 1974.

Although resistant varieties were developed, the WA industry did not produce significant quantities of canola again until the early-mid 1990s. The first Australian varieties were Wesreo (released 1978) and Wesway (released 1979), which were low-erucic-acid, blackleg-resistant varieties from WA. In Australia, canola is used to denote varieties with erucic acid level <2% and total glucosinolates <40 µmol/g. The first canola-quality *B. napus* varieties to be released were Wesroona, in WA in 1980, and Marnoo, from Victoria in 1980. Marnoo was higher yielding and had much lower glucosinolate levels than earlier varieties and so became a popular variety, particularly in Victoria.

However, Marnoo's limited blackleg resistance was a handicap in New South Wales. Growers there had been growing mainly Span, and quickly adopted Jumbuck (*B. rapa* variety, released 1982) because of its better yield, quality and disease resistance. In 1987, with the release of Maluka and Shiralee (both *B. napus*) from New South Wales, high-quality canola varieties became available. These were the first varieties to combine canola quality with blackleg resistance and high yields. They also resulted in a trend back to *B. napus* varieties.

The first hybrid canola, Hyola 30, was released by Pacific Seeds in 1988, followed by Hyola 42 in 1991. Triazine-tolerant (TT) canola was first commercialised with the release of the variety Siren in 1993. Siren was late maturing with low yield and oil content but was useful where crucifer weeds reduced the chances of success with canola. New TT varieties rapidly followed, both early (Karoo and Drum) and mid-season (Clancy and Pinnacle) maturity. This led to the rapid adoption of TT canola across Australia, especially in WA.

The TT varieties continue to have a yield disadvantage of 10–15%, and about 3–5% lower oil content than conventional varieties, but they are accepted by farmers because they allow canola to be grown where it could not previously.

Since the early 1990s, canola production has extended into lower rainfall areas in all states, even where rainfall is as low as 325 mm/year. This expansion has caused plant breeders to select earlier maturing varieties, with the release of Monty in 1998 and

Mystic in 1999. Early-maturing varieties currently have lower oil contents than mid-season types and often have slightly lower resistance to blackleg; however, further work is being conducted to improve these types.⁸

The first imidazolinone-tolerant (Clearfield®) variety was released in 1999, further expanding weed-control options. Genetically modified glyphosate-tolerant varieties, incorporating the Roundup Ready® trait, were grown commercially for the first time in 2008 in New South Wales and Victoria. High oleic, low linolenic acid varieties were grown commercially for the first time in 1999. These varieties differ from conventional canola in the fatty acid profile of the oil, which increases its uses, especially for deep frying.⁹

A.1.3 Domestic production

Australian canola production has averaged ~1.4 Mt/year, ranging from 512,000 t to 2.46 Mt. The total Australian oilseed crush capacity is ~1.1 Mt, with much of this in the eastern states. Some 550,000–650,000 t of canola is crushed annually, with the main export markets for surplus seed being Japan, Pakistan, Bangladesh, China and the European Union.

The vast majority of canola oil is used in the food industry: about one-third in spreads and cooking oil, and two-thirds in the commercial food-service sector (Figure 2). About 20–25% of Australian canola oil is exported. Canola meal, the main byproduct of crushed canola, is used as a high-protein feed for intensive livestock, mainly in the pig, poultry and dairy industries.



Figure 2: Most of Australia's canola oil is used in the food-service sector.

The challenge for growers and the industry over the next few years will be to continue to improve productivity by adopting best practice management and being responsive to climate variability to ensure a stable supply of high-quality oilseed for domestic

⁸ B Colton, T Potter. History. Australian Oilseeds Federation, http://www.australianoilseeds.com/_data/assets/pdf_file/0010/2701/Chapter_1_-_History.pdf

⁹ D McCaffrey (2009) Introduction. In Canola best practice management guide for south-eastern Australia. (Eds D McCaffrey, T Potter, S Marcoft, F Pritchard) GRDC, http://www.grdc.com.au/uploads/documents/GRDC_Canola_Guide_All_1308091.pdf

and international markets. ¹⁰ Table 1 shows production in four states for 2013–14 and estimated production for 2014–15.

Table 1: Canola production in New South Wales, Victoria, South Australia and Western Australia
Sources: industry estimates, GIWA, PIRSA

	Final 2013–14		Estimate 2014–15	
	Harvested area (ha)	Production (t)	Area planted (ha)	Production (t)
NSW	600,000	900,000	550,000	750,000
Vic	400,000	700,000	400,000	700,000
SA	300,000	500,000	280,000	450,000
WA	1,180,000	1,800,000	1,250,000	1,750,000
Total	2,480,000	3,900,000	2,480,000	3,650,000

A.1.4 Canola in the western region

Canola has become an important crop in WA, with production in 2013 being 1.8 Mt, worth just over \$1 billion to the state's economy (Figure 3). Nearly all WA canola production is exported, predominantly into Asia for human use and to Europe for biofuels. The Department of Agriculture and Food WA has a strong research, development and extension program for canola, with a focus on developing profitable agronomic packages and overcoming pest and disease constraints. ¹¹

Production

Canola is WA's third largest crop after wheat and barley, with production increasing to well over 1 Mt over the past 5 years on the back of rising world demand and prices. WA is the leading Australian state for canola production, accounting for ~40% of the nation's 5-year average production of 3.4 Mt.

The state has a reputation for producing canola with a high oil content, often 2–4% above that of other states. ¹²

¹⁰ D McCaffrey (2009) Introduction. In Canola best practice management guide for south-eastern Australia. (Eds D McCaffrey, T Potter, S Marcroft, F Pritchard) GRDC, http://www.grdc.com.au/uploads/documents/GRDC_Canola_Guide_All_1308091.pdf

¹¹ J Paterson, I Wilkinson (2015) Western Australian canola industry. Department of Agriculture and Food, Western Australia, <https://www.agric.wa.gov.au/canola/western-australian-canola-industry>

¹² J Paterson, I Wilkinson (2015) Western Australian canola industry. Department of Agriculture and Food, Western Australia, <https://www.agric.wa.gov.au/canola/western-australian-canola-industry>

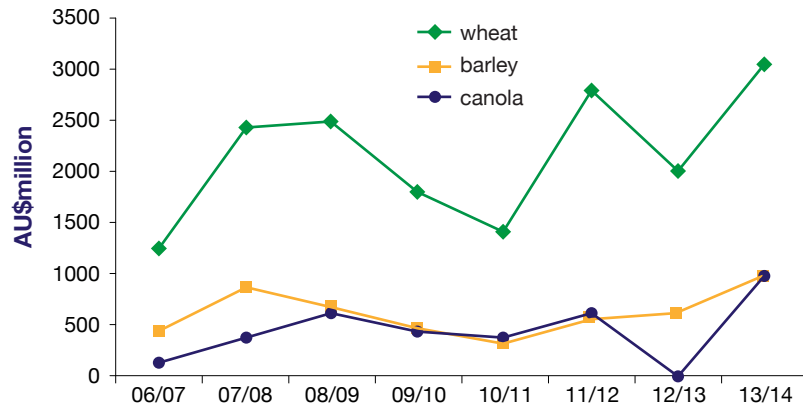


Figure 3: Relative value of production (AU\$ million) of Western Australian wheat, barley and canola industries.

As well as being profitable in its own right, canola has become the most important break crop in WA cereal production systems, overtaking lupin because of better prices and better weed-control options.

Canola in WA is grown under sustainable farming systems that can be certified to meet sustainability criteria required to access the European Union markets.

Both conventional and genetically modified canola varieties are grown in WA, with strict segregation in the supply chain allowing the two systems to co-exist.¹³

Exports

Western Australia exports nearly all of the canola it produces, accounting for 40–50% of the nation's total canola exports and ~7% of global exports.

The value of WA canola exports has increased 5-fold since 2000, with a 5-year average of \$440 million/year. The major markets for WA canola are South Korea, Japan, Netherlands, Malaysia and Germany.¹⁴

Processing

Two locally based canola crushers operate and both are small by international industry standards. These are at Pinjarra and Kojonup. Between the two local crushers, ~60,000 t of canola seed is processed per year, representing ~8% of the state's total canola production.¹⁵

A.1.5 Hybrids

A hybrid is a plant created by cross-pollinating male and female parents of different inbred lines. A hybrid has the benefit of heterosis (hybrid vigour). Hybrid canola generally has higher yield potential than traditional, inbred, open-pollinated varieties.

¹³ J Paterson, I Wilkinson (2015) Western Australian canola industry. Department of Agriculture and Food, Western Australia, <https://www.agric.wa.gov.au/canola/western-australian-canola-industry>

¹⁴ J Paterson, I Wilkinson (2015) Western Australian canola industry. Department of Agriculture and Food, Western Australia, <https://www.agric.wa.gov.au/canola/western-australian-canola-industry>

¹⁵ J Paterson, I Wilkinson (2015) Western Australian canola industry. Department of Agriculture and Food, Western Australia, <https://www.agric.wa.gov.au/canola/western-australian-canola-industry>

This improved yield is achieved through a combination of superior traits such as larger seeds, leading to early vigour, and better stress tolerance. However, hybrid seed should never be retained for sowing because it will not produce true copies of the original hybrid plant.¹⁶

Although the first canola hybrid was released in 1988, only recently have hybrids been grown on a large scale. Since the introduction of Roundup Ready and Imidazolinone Tolerant (IT) hybrid canola into Australia, seed companies have focussed more on these hybrids, at the expense of open pollinated triazine tolerant (TT) varieties. This places a dramatic increase in seed costs on growers which is likely to restrict further expansion of the canola growing area and is likely to decrease the area sown to canola in the lower rainfall higher risk areas of WA's grain growing area.

The major global producers are China, the European Union, Canada and India. Canada is the major exporter and Japan and the European Union are the major importers. Australian canola competes with Canadian product in the international marketplace. Canola is the third most important winter grain crop in Australia, behind wheat and barley.¹⁷

¹⁶ GRDC (2010) Growing hybrid canola. GRDC Canola Fact Sheet, August 2010, https://www.grdc.com.au/~/_/media/D4B939DB8790453FB2D6CBD04CA11B78.pdf

¹⁷ D McCaffrey (2009) Introduction. In Canola best practice management guide for south-eastern Australia. (Eds D McCaffrey, T Potter, S Marcoft, F Pritchard) GRDC, http://www.grdc.com.au/uploads/documents/GRDC_Canola_Guide_All_1308091.pdf