

SECTION A

Introduction

A.1 Crop overview

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.).¹

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 'Can(adian)' O(il) L(ow) A(cid).²

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) ([CODEX International Food Standards 1999](#)), and are often referred to as 'double low' or 'double zero' varieties.³

Australian canola typically contains <10 µmol/g of glucosinolates, 43–45% oil, and 38–40% protein in oil-free meal.⁴

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.⁵

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.⁶

¹ Canola. Wikipedia, <http://en.wikipedia.org/wiki/Canola>

² CanolaInfo (2015) Where does canola come from? CanolaInfo, <http://www.canola.info/canola/where.php>

³ 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)

⁴ AEGIC. Australian grain note: canola. Australian Export Grains Innovation Centre, http://www.australianoilseeds.com/oilseeds_industry/quality_of_australian_canola

⁵ CanolaInfo (2015) Where does canola come from? <http://www.canola.info/canola/where.php>

⁶ Canola. Wikipedia, <http://en.wikipedia.org/wiki/Canola>



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 Meggett Ltd.

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 Western Australia 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 Western Australia, 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 Western Australian 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 Western Australia. 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 Western Australia 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 cruciferous weeds reduced the chances of success with canola. New TT varieties rapidly followed, both early (Karoo and Drum) and midseason (Clancy and Pinnacle) maturity. This led to the rapid adoption of TT canola across Australia, especially in Western Australia, where TT canola now comprises ~90% of the total crop.

The TT varieties continue to have a yield disadvantage of 10–15%, and about 3–5% lower oil content than conventional, Roundup Ready and Imi-tolerant 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 1999.⁷

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.⁸

In Victoria, the main production area is the south-west but the crop is important across the grainbelt. The release of earlier maturing cultivars has extended canola's range into the Mallee.⁹

A.1.3 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. 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.¹⁰

Although the first canola hybrid was released in 1988, only recently have hybrids been grown on a large scale. Canola breeding of the future will focus more on hybrids. The major global producers are China, the European Union, Canada and India.

A.1.4 Global production

The major global canola 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

⁷ B. Colton, T. Potter. History. Australian Oilseeds Federation, http://www.australianoilseeds.com/_data/assets/pdf_file/0010/2701/Chapter_1_-_History.pdf

⁸ 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

⁹ DEPI (2012) Growing canola. Department of Environment and Primary Industries Victoria, AG0750, updated July 2012. <http://www.depi.vic.gov.au/agriculture-and-food/grains-and-other-crops/crop-production/growing-canola>

¹⁰ GRDC (2010) Growing hybrid canola. GRDC Canola Fact Sheet, August 2010, https://www.grdc.com.au/~/_media/D4B939DB8790453FB2D6CBD04CA11B78.pdf

i More information

[Canola industry in South Australia](#)

marketplace. Canola is the third most important winter grain crop in Australia, behind wheat and barley.¹¹

A.1.5 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 and international markets.¹² Table 1 shows production in four states for 2014–15 and estimated production for 2015–16.

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	575,000	835,000	510,000	816,000
Vic	483,000	647,000	380,000	456,000
SA	302,000	314,000	221,000	287,000
WA	1,247,000	1,635,000	1,143,000	1,446,000
Total	2,607,000	3,431,000	2,254,000	3,005,000

¹¹ 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

¹² 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