



SOUTHERN

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& DEVELOPMENT
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TRITICALE

SECTION A

INTRODUCTION

CROP OVERVIEW | GROWING REGIONS | BRIEF HISTORY

Introduction

A.1 Crop overview

Triticale is an established small cereal crop that combines the productivity of wheat with the hardiness of rye. Triticale (genus X *Triticosecale*) was developed by human intervention from crosses between wheat (genus *Triticum*) and rye (genus *Secale*). The grains are longer than wheat seeds and plumper than rye, and colour can range from the tan of wheat to the grey-brown of rye (Photo 1). Triticale has several advantages in Australian conditions: this relatively low input cereal crop has good disease resistance, particularly to rusts. It is a hardy plant, which produces a feed grain as high quality as wheat.

Triticale makes good use of land that is marginal for other cereals. It has been developed to combine the high yield potential and quality of wheat with the adaptability of rye, and it is adapted to a wide range of soil types and environments. Triticale has an aggressive root system that binds light soils better than wheat, barley or oats. Under ideal conditions, researchers have found that triticale can out-yield wheat, barley and sometimes oats. It can out-yield wheat in several situations: on acid soils, in cool high-rainfall areas, and on low-nutrient soils, such as those with low levels of manganese and copper. Triticale is well established as an ingredient in livestock rations.



Photo 1: Grains of wheat (left), rye (middle) and triticale (right). Note that triticale grain is significantly larger than wheat grain.

Source: [USDA](#)

It is a tall crop bred for strong straw strength, which can be useful in rocky paddocks or circumstances where crops have been known to lodge. Triticale can out-yield barley under good conditions, and its dual purpose use as grain or forage makes it a useful crop for mixed enterprise farms.

Triticale in Australia has a spring growth habit, which means it behaves similarly to most cereal crops, maturing in late spring to early summer. Breeding and selection programs have ensured varieties possess a range of disease and pest characteristics, which can complement disease management for other cereals. It can also carry diseases that may affect other cereal species.

Triticale and wheat are similar crops, but triticale represents a valuable alternative to wheat, due to its greater biomass production and grain yield in Mediterranean-type growing conditions, such as those in parts of southern Australia.¹

Triticale can be less susceptible to the common fungal diseases of cereals, which make it suitable for use in rotations where stubble is retained. Some varieties have

¹ S Bassu, S Asseng, F Giunta, R Motzo (2013) Optimizing triticale sowing densities across the Mediterranean Basin. *Field Crops Research* 144, 167–178.

 MORE INFORMATION

[A review of triticale uses and the effect of growth environment on grain quality](#)

[Triticale agronomy](#)

good resistance to stem, leaf and stripe rusts, mildew and *Septoria tritici* blotch, as well as both resistance and tolerance to cereal cyst nematode (CCN).

Triticale has poor tillering capacity and good tolerance to shattering. This makes it a useful cereal as a cover crop to establish undersown lucerne or medic. Seeding rates may need to be reduced, however.²

Besides its use as a feed grain, triticale can be used as a forage crop for ruminants and as a cover crop.

When added to a rotation, triticale may increase yields of other crops in the rotation, reduce costs, improve distribution of labour and equipment use, provide better cash flow, and reduce weather risk. Additionally, production of triticale may provide environmental benefits, such as erosion control and improved nutrient cycling.³

Triticale yields more than its ancestors in two types of marginal conditions: in the highlands, where acid soils, phosphorus deficiency and foliar diseases are dominant; and in the arid and semi-arid zones, where drought affects crops production.⁴

Triticale is a mainstream crop in Australia, mostly as spring types grown for grain production, but also as longer-season, dual-purpose types grown for fodder as hay, silage or grazing, followed by grain production.

The grain is primarily used as stock feed, with a low level of triticale use in food products. Most of the grain is used domestically although small amounts are exported.⁵

Triticale usually commands a lower price per tonne at the farm gate. An exception to this can be where there is strong local demand for feed grain, where a better cash return with low transport costs could be expected.⁶

The market for triticale is small compared to other cereals because it must compete with barley as the preferred winter feed grain. To combat this, breeders have released improved and better adapted varieties that have good yield and grain quality characteristics, with many of the factors identified as the cause of inferior performance having been eliminated.⁷

A.1.1 Triticale for human consumption

Small amounts of triticale are marketed as niche products for human food consumption. Uses include as a flour supplement to wheaten flour for bread, biscuits and cakes, as rolled whole grains for breakfast cereals, triticale noodles and in the brewing and distilling industries (Photo 2). Triticale has a distinctive nutty, aromatic and naturally sweet flavour.⁸ Triticale as a main cereal for breadmaking is constrained by variations in breadmaking quality, low and inferior gluten content and lower flour yield. Further, with wheat and rye already established as the traditional bread cereals, it may take some time to influence consumers' preferences towards triticale.

2 Agriculture Victoria (2012) Growing triticale. <http://agriculture.vic.gov.au/agriculture/grains-and-other-crops/crop-production/growing-triticale>

3 LR Gibson, C Nance, DL Karlen (2005) Nitrogen management of winter triticale. Iowa State University. <http://farms.ag.iastate.edu/sites/default/files/NitrogenManagement.pdf>

4 M Mergoum, H Gomez-Macpherson (2004) Triticale improvement and production. FAO Plan Production and Protection Paper 179. Food and Agriculture Organization of the United Nations. <http://www.fao.org/3/a-y5553e/y5553e00.pdf>

5 KV Cooper, RS Jessop, NL Darvey 'Triticale in Australia' in M Mergoum, H Gomez-Macpherson (2004) Triticale improvement and production. FAO Plan Production and Protection Paper 179. Food and Agriculture Organization of the United Nations. <http://www.fao.org/3/a-y5553e/y5553e00.pdf>

6 P Matthews, D McCaffery, L Jenkins (2016) Winter crop variety sowing guide 2016. NSW Department of Primary Industries. http://www.dpi.nsw.gov.au/_data/assets/pdf_file/0011/272945/winter-crop-variety-sowing-guide-2016.pdf

7 Birchip Cropping Group (2004) Triticale agronomy—2004. <http://www.farmtrials.com.au/trial/13801>

8 Agriculture Victoria (2012) Growing triticale. <http://agriculture.vic.gov.au/agriculture/grains-and-other-crops/crop-production/growing-triticale>

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Photo 2: Wholegrain triticale flour (left) and kibbled triticale (right) milled for human consumption.

Source: [Blue Lake Milling](#)

As consumers in general become more health conscious, however, there is a growing awareness of the health benefits of including a range of cereal grains in a balanced diet. This increased consumption of grains, together with the current consumer trend of trying new products, is leading to an increase in consumer interest in seeking baked products, such as breads baked using cereal grains other than wheat. Thus, given the nutritional and agronomic advantages of triticale, the improvements taking place in terms of baking potential, and an increasing level of consumer interest in products made from alternative grain cereals, triticale is believed to have the necessary attributes to become an important food cereal for humans in the future. ⁹

Main culinary uses of triticale:

- Triticale flour: can be used to make biscuits, rye-type crispbreads, cakes and muffins. The flavour and texture of breads made from triticale are similar to that of light rye bread.
- Triticale flakes: Wholegrain triticale is pressed and rolled, and then may be used like rolled oats to make a hot breakfast cereal, or substituted for rolled oats in recipes (such as cookies and muffins).

Nutritional credentials of whole grain triticale:

- similar to wheat, with 13% protein, but lower in lysine and niacin
- lower in the protein complex that forms gluten
- a good source of phosphorus and magnesium, and a very good source of manganese
- contains B-group vitamins, most notably thiamin and folate ¹⁰
- One study suggested triticale could be a food source that reduces obesity and diabetes problems ¹¹

MORE INFORMATION

[Food uses of Triticale](#)

⁹ CM McGovern, F Snyders, N Muller, W Botes, G Fox, M Manley (2011) A review of triticale uses and the effect of growth environment on grain quality. *Journal of the Science of Food and Agriculture* 91(7), 1155–1165.

¹⁰ Grain and legumes nutrition council (2016) Triticale. <http://www.glnrc.org.au/grains/types-of-grains/triticale/>

¹¹ Cooper (1985) in S Tshewang (2011) Frost tolerance in Triticale and other winter cereals at flowering. *Environmental and Rural Science*. University of New England. https://e-publications.uned.edu.au/vital/access/manager/Repository/une:8821jsessionid=C91FFA8964B3A49AD3A44FC3BD03EA2E?exact=sm_contributor%3A%22Birchall+C%22

A.1.2 Triticale for animal consumption

The major uses for triticale grain are as a feed supplement in the dairy industry, as a component ingredient in beef feedlots, and as a constituent of compound rations for intensive livestock (pigs and poultry) rations. In livestock diets, triticale has a similar role to other cereals. Triticale is higher in energy than barley, and has many desirable nutritional characteristics for all classes of livestock. It is primarily an energy source, having moderate protein content with high starch and other carbohydrates, giving it high energy content.



Photo 3: Triticale is often chosen by farmers for stock feed due its high nutritional qualities.

Source: [The Australian Dairy Farmer](#)

Triticale is a direct substitute for barley or wheat in animal feed rations. In pig and poultry diets, triticale is equal to or better than wheat or maize in terms of energy value, and superior in terms of protein content and quality (essential amino acid content and availability). In dairy rations, triticale has an advantage over barley due to its high, easily metabolised energy, palatability and ease of milling.¹²

A key physical feature of triticale is that it has a hardness index almost half that observed for wheat and barley. This soft grain requires less mechanical energy to mill it before being added to livestock diets than does either wheat or barley.

On farm, triticale can be fed to livestock in the same way wheat or barley would be.¹³

Triticale growing regions correspond with the bulk of Australia’s intensive livestock production, making triticale grain readily accessible by most feed mills.

There is a high demand for feed grain in the Wimmera region, especially for triticale, from the dairy and pig industries. The reduced transport costs and the slightly higher price for triticale compared to other feed grains makes triticale an attractive proposition.¹⁴

i MORE INFORMATION

[Triticale: stock feed guide](#)

[A guide to the use of Triticale in livestock feeds](#)

¹² Birchip Cropping Group (2004) Triticale agronomy—2004. <http://www.farmtrials.com.au/trial/13801>

¹³ Agriculture Victoria (2012) Growing triticale. <http://agriculture.vic.gov.au/agriculture/grains-and-other-crops/crop-production/growing-triticale>

¹⁴ University of Sydney (2012) Triticale. http://sydney.edu.au/agriculture/plant_breeding_institute/key_work_results/triticale.shtml

i MORE INFORMATION

[Triticale offer benefits over wheat for biofuel](#)

A.1.3 Triticale for biofuel

Alternative fuels are required owing to the impending shortage and soaring prices of fossil fuels, and increasing global concern about the welfare of the environment. Biofuels are produced from organic matter and are a possible alternative fuel. Modern cultivars of triticale are a competitive feedstock for ethanol production. Advantageously, triticale possesses an autoamylolytic enzyme system that aids in converting large quantities of starch into fermentable sugars. Triticale is better suited to the production of biofuel than wheat. The use of triticale for biofuels has been explored in Europe, and could have potential elsewhere in the world.

A.2 Growing regions

The southern grains region stretches from Victoria, through to Tasmania and South Australia. The rainfall pattern ranges from uniform in central New South Wales through to winter-dominant in Victoria, Tasmania and South Australia.

This is a vast region of the country with a typically Mediterranean climate of dry summers and comparatively reliable winter rainfall, lending itself to winter crop production.

Planting of the winter crop depends on ‘opening rains’; it usually begins in May, and can continue through until late July. The winter crop harvest can begin in late October and continue through until January in the higher rainfall areas.¹⁵

The South Australia–Victoria Mallee region comprises 7 million hectares of land, of which three quarters are allocated to dryland agriculture. It stretches from Penong in South Australia to Kerang in Victoria (Figure 1).

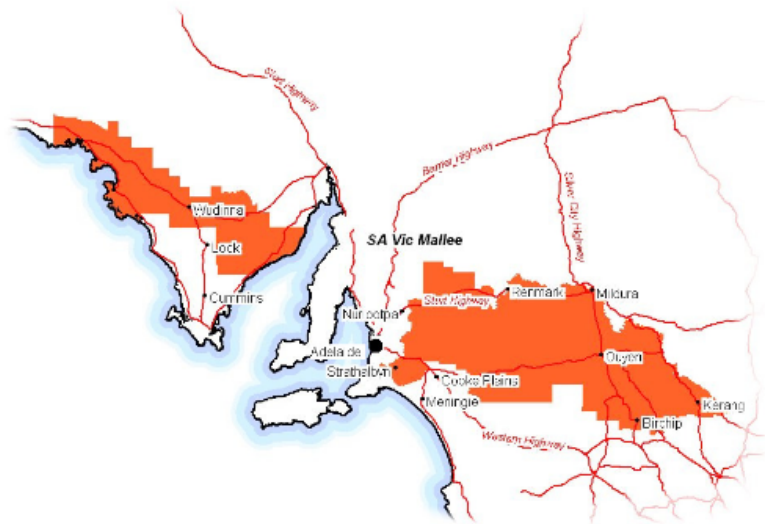


Figure 1: South Australia–Victoria Mallee Agroecological Zone.

Source: GRDC

Crops suitable for growing in the Mallee region during the winter are triticale, cereal rye, wheat, barley, oats, lupins, vetch, canola, field peas, chickpeas, faba beans, lentils and safflower.¹⁶

¹⁵ AEGIC (2016) Australian grain production—a snapshot. Australian Export Grains Innovation Centre, 22/08/2016. <http://aegic.org.au/australian-grain-production-a-snapshot/>

¹⁶ A Grejdanus, M Kragt (2014) The Grains Industry: An overview of the Australian broad-acre cropping. University of Western Australia. <http://ageconsearch.umn.edu/bitstream/164256/2/WP1400002.pdf>

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The area sown to triticale has declined substantially in recent years, with growers favouring wheat or barley (Table 1 and Figures 2–4).¹⁷

Table 1: Triticale production estimates in South Australia compared with a 5 year average.

	2010–11	2011–12	2012–13	2013–14	2014–15	5 year average	2015–16
Ha	85,700	80,200	69,200	49,300	27,100	62,300	21,800
Tonnes	167,100	117,500	95,920	86,500	44,300	102,300	32,700

Source: PIRSA

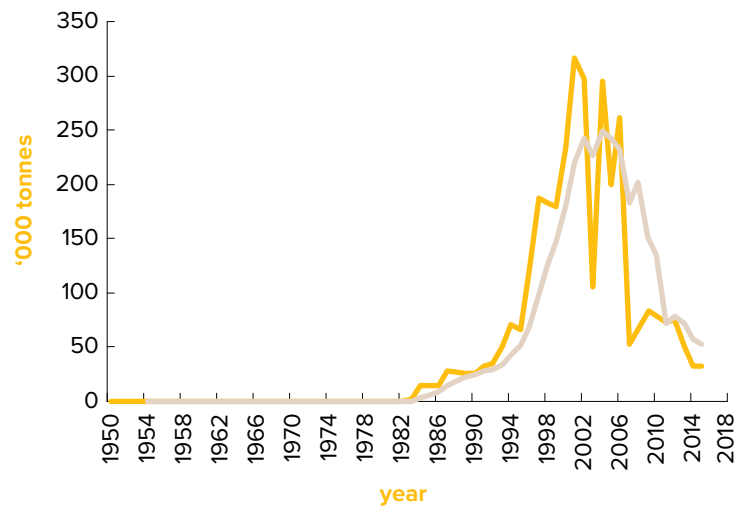


Figure 2: Triticale production in Victoria. Grey line = five-year moving average.

Source: AgData

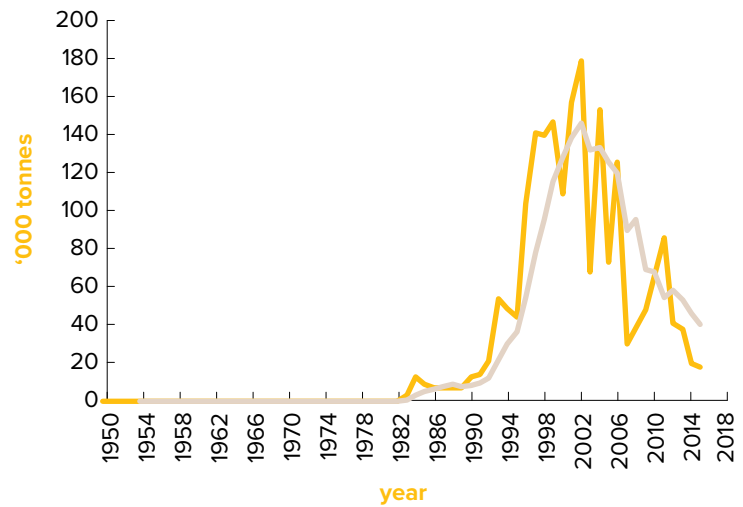


Figure 3: Triticale production in South Australia. Grey line = five-year moving average.

Source: AgData

17 Victorian Winter Crop Summary (2016) Agriculture Victoria. www.agriculture.vic.gov.au/_data/assets/word_doc/0004/318883/Triticale-2016.docx

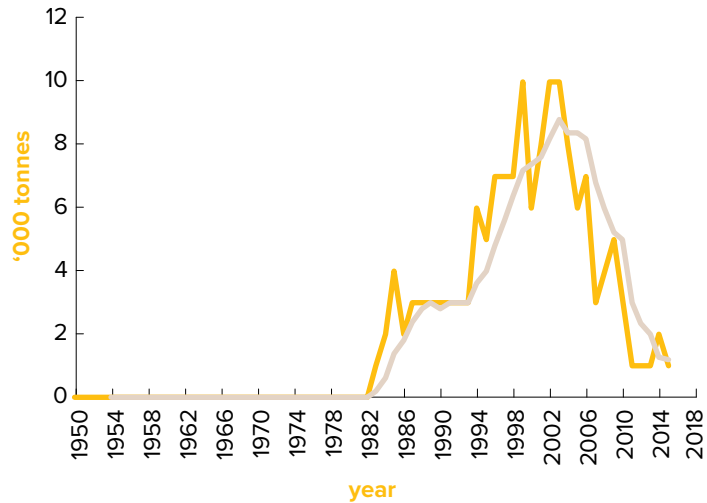


Figure 4: Triticale production in Tasmania. Grey line = five-year moving average.

Source: [Ag Data](#)

A.3 Brief history

The first wheat/rye cross-breeding occurred in Scotland in 1875, but this crossing was sterile; in 1888, German botanists first discovered how to produce a fertile hybrid of the two grains. The name triticale first seems to have been used in Germany about 1935.¹⁸

In the 1950s, plant geneticists hoped that a cross fertilisation of wheat and rye would produce a cereal with superior yield. The hardiness and disease resistance of rye was combined with the milling and baking qualities of wheat.

In 1970, the first commercial variety of triticale went on sale, and triticale bread, flour and breakfast cereals became available. Triticale was promoted as a ‘miracle crop’ during this time, but initial interest faded when crops were inconsistent and acceptance was slow. As such, triticale has not achieved its objectives to dominate as a grain for food production. Today in Australia, triticale is found in a range of grain foods.¹⁹

A.3.1 Triticale in Australia

Triticale was introduced into Australia in the early 1970s as experimental lines for evaluation. Breeding and selection programs were initiated at several universities and state government departments of agriculture, and a number of varieties were released, which were mostly spring-grain lines introduced by CIMMYT (International Maize and Wheat Improvement Centre). Triticale was quickly taken up as a useful crop for grain and fodder production on acid and waterlogged soils, and for producing an economic and soil-conserving crop on lower rainfall, nutrient-impooverished soils. Initially, triticale was mostly used on-farm or traded locally as stock feed. It was often sought as a more easily-traded feed grain than wheat, which had to be marketed through the Australian Wheat Board. On the other hand, as triticale was not a well-known grain, and as the quantity available was limited, in some areas triticale could prove difficult to sell for a good price, which tended to limit its adoption.

¹⁸ Oldways Whole Grains Council. Rye and triticale: August grains of the month. <http://wholegrainscouncil.org/whole-grains-101/easy-ways-enjoy-whole-grains/grain-month-calendar/rye-triticales-august-grains-month>

¹⁹ Grain and legumes nutrition council (2016) Triticale. <http://www.glnl.org.au/grains/types-of-grains/triticales/>

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The first Australian cultivar was Growquick, a later-maturing line of poor-grain type, most suitable for grazing use. By the mid-1980s, 11 grain cultivars had been released.

In the early 1980s, wheat stem rust races evolved in Queensland, and were virulent on these cultivars. In order to reduce the likelihood of rust epidemics and further evolution of virulent races, the rust-susceptible cultivars were no longer recommended, and breeders sought to produce cultivars with full rust resistance. Once this was achieved, an increasing amount of triticale was produced and after many years of good results, users gained confidence in this grain, driving an increasing demand for triticale and improved prices. Triticale gained popularity in the Mallee region during the early 2000s to a point where it was treated as an economic crop. More recently, the area of production has declined.²⁰

²⁰ KV Cooper, RS Jessop, NL Darvey 'Triticale in Australia' in M Mergoum, H Gomez-Macpherson (2004) Triticale improvement and production, FAO Plan Production and Protection Paper 179. Food and Agriculture Organization of the United Nations. <http://www.fao.org/3/a-y5553e/y5553e00.pdf>