SOUTHERN
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GRDC™ GROWNOTES™

GRDC™ GRAINS RESEARCH & DEVELOPMENT CORPORATION

TRITICALE

SECTION 3

PLANTING

SEED TREATMENTS | TIME OF SOWING | TARGETED PLANT POPULATION | CALCULATING SEED REQUIREMENTS | SOWING DEPTH | SOWING EQUIPMENT

Planting

Key messages:

- Triticale is not usually prone to infection from smuts and bunt. However, it is good insurance to apply a seed dressing to the grain when it is being graded.
- Triticale generally has a similar sowing time requirement to other cereals, and should take a priority in the sowing schedule commensurate with its importance to the overall cropping enterprise. Triticale often suffers more from frost damage than wheat, hence it should generally be sown later.
- Aim to achieve the same plant populations as for wheat; i.e. set the seeder 25–40% above the setting recommended for wheat, as triticale grain is larger than wheat grain, and because plants tiller less than wheat. [1]
- Depending on seed size, triticale should be sown at a seeding rate of 75–100 kg/ha.
- Recommended sowing depth for triticale ranges between 2–5 cm. [2]

Most cultural practices needed for growing triticale can be taken directly from wheat. These include:

- managing for seedbed preparation
- seeding rate
- seeding depth
- seeding date
- seeding methods [3]

3.1 Innoculation

Not applicable to this crop.

3.2 Seed treatments

Seed treatments are applied to seed to control diseases, such as smuts, bunts or rust, and insects. Triticale is not usually prone to infection from smuts and bunt; however, it is good insurance to apply a seed dressing to the grain when it is being graded. Stripe rust may be a problem in triticale, and there are now options to treat seed to provide seedling protection against stripe rust. [4]

Fungicide seed dressings are used to protect the triticale crop from seed borne disease, such as loose smut. This treatment should form an integral part of the triticale disease management program, and will vary with variety and sowing time. It is recommended that growers seek local advice. [5]

When applying seed treatments, always read the chemical label and calibrate the applicator. Seed treatments are best used in conjunction with other disease-management options, such as crop and paddock rotation, clean seed, and resistant varieties, especially when managing diseases such as stripe rust.

There are risks associated with using seed treatments. Research shows that some seed treatments can delay emergence by:

- slowing the rate of germination

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

2 DAFWA (2015) Monitoring sowing depth, Department of Agriculture and Food, Western Australia. https://www.agric.wa.gov.au/mycrop/monitoring-sowing-depth

3 E Collier, L Oatway (2016) Triticale crop production, Alberta Agriculture and Forestry. http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/fcd10571

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

5 Waratah Seed Co Ltd (2010) Triticale: planting guide. http://www.porkcrc.com.au/1A-102_Triticale_Guide_Final_Fact_Sheets.pdf

- shortening the length of the coleoptile, the first leaf and the sub-crown internode

If there is a delay in emergence due to decreased vigour, it increases exposure to pre-emergent attack by pests and pathogens, or to soil crusting; this may lead to a failure to emerge. The risk of emergence failure increases when seed is sown too deeply or into a poor seedbed, especially in varieties with shorter coleoptiles. As the amount of certain fungicides increases, the rate of germination slows (Figure 1).

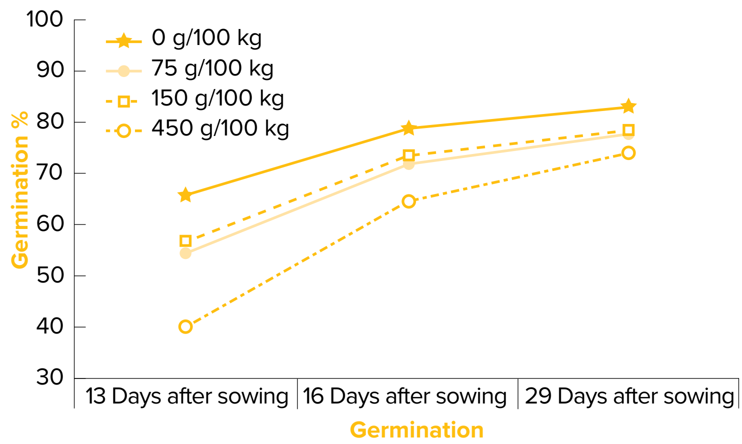


Figure 1: *Impact of seed-treatment fungicide on the rate of germination.*

Source: NSW DPI based on P Cornish, 1986

MORE INFORMATION

Cereal seed treatments 2016

Product registrations change over time, and may differ between states and between products containing the same active ingredient. The registration status for the intended use pattern in your state must be checked on the current product label prior to use. [6]

3.2.1 Emergence problems

Caution should be taken in using seed treatment products for smut and foliar disease control, as they may reduce coleoptile length and cause emergence problems under some conditions.

Factors other than seed treatments can cause poor seedling emergence. These include deep sowing, surface crusting, short coleoptile varieties, soil temperatures and trifluralin.

Sowing too deep is a common cause of emergence problems. The coleoptile, which surrounds the first leaf until the shoot emerges, protects and guides the shoot as it grows through the soil. If seed is sown deeper than the length of the coleoptile, the plant can fail to emerge.

Because coleoptile lengths vary from one variety to another some varieties can tolerate deeper sowing than others. Coleoptile lengths vary greatly from one batch of seed to another. The source of seed is often more critical than the variety in determining coleoptile length. For this and other reasons, farmers should seek to use the best seed possible.

Most emergence problems occur in heavy clay soils where surface sealing occurs. Extra care is required when treated seed and/or trifluralin is used in such soils. [7]

6 NSW DPI District Agronomists (2007) Wheat growth and development, PROCROP Series, NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0008/516185/Procrop-wheat-growth-and-development.pdf

7 H Wallwork (2016) Cereal seed treatments 2016, SARDI. http://www.pir.sa.gov.au/__data/assets/pdf_file/0005/237920/cerealseedtreat2017_web.pdf

MORE INFORMATION

GRDC Fact sheet: Targeted nutrition at sowing

GRDC Fact sheet: Time of sowing—Southern Region

VIDEOS

WATCH: GCTV Extension files: Wheat sowing strategies

WATCH: GCTV Extension files: Early sowing opportunities

WATCH: GRDC: Early sowing in the LRZ

3.2.2 Fertiliser at seeding

The amount of nitrogen safely placed with the seed will vary depending on soil texture, amount of seedbed utilisation and moisture conditions. Higher amounts of nitrogen can be safely applied with the seed if it is a polymerised form of urea where the nitrogen is released over the period of several weeks. If soil moisture is marginal for germination, high rates of fertiliser should not be placed with the seed. Both nitrogen and phosphorous can be banded prior to seeding, but take care to avoid loss of seedbed moisture and protective crop residue. Place phosphorous with or near the seed at seeding time or band prior to seeding. [8]

3.3 Time of sowing

Triticale generally has a similar sowing time requirement to other cereals and should take a priority in the sowing schedule commensurate with its importance to the overall cropping enterprise. Optimum time of sowing depends largely on the variety being grown (Table 1). Triticale often suffers more from frost damage than wheat, hence it should generally be sown later.

In the Victorian Mallee, the first two weeks of May are the ideal time to sow triticale, although the seasonal break often dictates the actual sowing opportunity. For the Wimmera and north central, mid-to-late May is generally the optimum sowing time. For north-eastern Victoria, depending on the variety, the whole month of May is potentially ideal. In the case of a long season variety (e.g. Jackie), sowing in the north-east can begin from early April. South-western Victoria has a wider sowing window due to a longer growing season and, depending on the variety, crops may be sown from early May to late June.

Acting promptly when a sowing window is available has proven critical over many seasons. Delayed sowing has generally proven costly, although to sow very early increases frost risk. Triticale appears to be more sensitive to frost damage than other cereals. Dry sowing for a portion of the crop is an option that has been very successful, and can be considered for triticale as well as other cereals. [9]

Long season varieties, such as Endeavour(D and Tobruk(D, can be sown as early as mid-February if seasonal conditions (i.e. rainfall) allows. Tobruk(D should only be sown this early if it is going to be grazed. Main season varieties, such as the traditional Tahara and Berkshire(D, should be sown at the same time as main season wheat, during May and early June.

8 Alberta Government (2016) Fall rye production. http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex1269/$file/117_20-1.pdf

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

VIDEOS

WATCH: GCTV15: Optimal flowering—follow up

WATCH: Over the Fence south: Early sowing protects crops from winter wet

Table 1: *Triticale time of sowing guide. This table is a guide only and has been compiled from breeder observations and local departmental agronomists.*

	April				May				June				July			
MALLEE																
Berkshire(b), Bison(b), Chopper(b), Fusion(b), KM10, Rufus, Tahara, Goanna, Yowie				>	>	X	X	X	X	X	<	<				
WIMMERA																
Astute(b), Berkshire(b), Bison(b), Fusion(b), Rufus, Tahara, Goanna, Yowie						>	>	X	X	X	X	X	X	<		
Chopper(b), KM10							>	>	X	X	X	X	X	X	<	
NORTH CENTRAL																
Astute(b), Berkshire(b), Bison(b), Credit, Fusion(b), Rufus, Tahara, Goanna, Yowie					>	>	X	X	X	X	<	<				
Chopper(b), KM10						>	>	X	X	X	<	<				
NORTH EAST																
Jackie	X	X	X	X	X	X	<									
Abacus				>	X	X	X	<	<							
Astute(b), Berkshire(b), Bison(b), Credit, Fusion(b), Tahara, Goanna, Yowie					>	X	X	X	<							
Chopper(b)						>	X	X	X	<						
SOUTH WEST																
Endeavour(b), Jackie				>	X	X	X	X	X	X	<	<				
Abacus, Prime 322					>	>	X	X	X	X	X	X	<	<		
Astute(b), Berkshire(b), Bison(b), Credit, Fusion(b), Kosciuszko, Tahara, Tobruk(b)						>	>	X	X	X	X	X	<	<		

>earlier than ideal, X optimum sowing time, < later than ideal but acceptable

Source: Agriculture Victoria

Lodging

Triticale can lodge because of:

- height
- lush growth under conditions of high moisture and fertility
- high seeding rates

Lodging in cereal crops is influenced by structural plant traits as well as environmental conditions. Lodging in cereals is often a result of the combined effects of inadequate standing power of the crop and adverse weather conditions, such as rain, wind, and/or hail. Lodging is also cultivar dependent. For example, a tall, weak-stemmed wheat cultivar has a greater tendency to lodge than a semi- dwarf cultivar with stiffer straw. Under conditions of high moisture and nitrogen fertility, semi-dwarf varieties are less prone to lodging than standard ones. Furthermore, short thick-strawed cultivars resist lodging better than tall cultivars. [10]

Triticale can be prone to lodging, however, earlier seeding appears to reduce this tendency towards lodging. [11]

10 Brook H, Nelson M. (2015). Lodging of cereal crops. Alberta Agriculture and forestry. http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/crop1271

11 E Collier, L Oatway (2016) Triticale crop production, Alberta Agriculture and Forestry. http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/fcd10571

3.4 Targeted plant population

The range of sowing rates varies with variety and end use (Table 2). Because triticale grain size is larger than wheat, higher sowing rates are needed to achieve the same plant density. Sowing rates approximately 20% higher than those for wheat are recommended (Photo 1). Before determining seed sowing rates, seed germination levels need to be known. [12]

Photo 1: *Triticale paddock sown according to targeted plant population.*

Source: Liebman M in MCCC

For information on seed quality testing, see Section 2: Pre-planting.

Aim to achieve the same plant populations as for wheat; i.e. set the seeder 25–40% above the setting recommended for wheat, as triticale grain is larger than wheat grain, and because plants tiller less than wheat. [13]

Table 2: *Recommended plant populations for different uses of triticale.* [14]

Purpose/growing conditions	Best sowing rate (kg/ha)
Grain only	60–90
Grain and grazing	100–120
Undersowing pastures	35–45
Irrigation/high rainfall	100–120

12 RS Jessop, M Fittler (2009) Triticale production manual: an aid to improved triticale production and utilisation, in Improved triticale production through breeding and agronomy, Cooperative Research Centre for an Internationally Competitive Pork Industry. http://www.apri.com.au/1A-102_Final_Research_Report_.pdf

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

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

Target plant populations for triticale can also vary according to rainfall (Table 3).

Table 3: *Plant establishment densities for triticale.*

Average rainfall (mm)	Planting populations (plants/m²)
250–350	160–180
350–450	180–200
450–550	200–220

Source: Crop Monitoring Guide (Victoria)—Top Crop Australia (Incitec/GRDC) in GRDC Cereal Crop Growth Stages

Triticale does not tiller well. The desired plant density for triticale is 180 plants/m^2 up to 200 plants/m^2 in high rainfall zones. Depending on seed size this equates to a seeding rate of 75–100 kg/ha. If sowing is delayed (or if sowing in light, sandy soils), the higher plant density should be the target. [15]

Triticale sown for grazing should be sown at a seeding rate to obtain 150 plants per m^2, which is the same as grazing wheat. The target population of grain-only triticale can be reduced to 100 to 120 plants per m^2, as for main season grain-only wheat.

APSIM modelling was conducted (using the Agricultural Production Systems sIMulator) to explore the optimal sowing density of triticale in Mediterranean-type environments. The tested model was then used to explore management options to maximize triticale yield. The response to sowing density was cultivar and rainfall-environment dependent. The simulation analysis indicated there was no yield advantage in higher sowing densities with a tall cultivar type in high yielding environments, despite its higher biomass growth rates. The highest yields were achieved at the early sowing date, at the sowing densities between 100 and 300 plants/m^2, in the high rainfall regions for both short and the tall cultivars. The simulation study suggests that sowing a short cultivar with a reduced radiation use efficiency but early vigour growth could increase current yields across different regions, seasons and management options in the Mediterranean climate. [16]

When sowing triticale as a cover crop (i.e. undersown with pasture), reduce the seeding rate to approximately 10 to 20% of normal, targeting 15–30 plants per m^2. [17]

Plant more weight of triticale seed per unit area than when planting wheat. This is because triticale has larger seeds than wheat (Table 4).

Table 4: *Typical values for characteristics of triticale.*

Seeds/kg	Volumetric grain weight (kg/hL)	Bulk densities	
		kg/m³	t/m³
23,000	65	650	0.65

Source: NSW DPI

Seed size influences plant density, with large seeds requiring a higher sowing rate than smaller seeds to target the same population. '1000 seed weight' is a measure of seed size. It should be determined for each seed lot, as results vary depending on how old the seed is and conditions it has been grown under. [18]

Despite the ability to compensate, targeting a variety's optimum plant density at sowing makes the most efficient use of water and nutrients. To reach a target

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

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

17 Waratah Seed Co Ltd (2010) Triticale: planting guide. http://www.porkcrc.com.au/1A-102_Triticale_Guide_Final_Fact_Sheets.pdf

18 K Condon (2003) Targeting optimum plant numbers, NSW Agriculture. http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0007/168523/targeting-optimum-plant-numbers.pdf

plant population for the environment and seasonal conditions, adjust sowing rates to allow for:

- sowing date—higher rates with later sowings
- seed germination percentage
- seed size
- seedbed conditions
- tillage, e.g. no-till
- double-cropping
- soil fertility
- soil type
- soil moisture and seasonal outlook
- weed seed burden—higher sow rates for increased plant competition, e.g. if combatting herbicide-resistant ryegrass populations. [19]

TOPCROP Victoria investigated sowing rates for wheat to achieve target plant densities using large-scale paddock demonstrations during the 2000 season. TOPCROP farmer groups established 30 sites across Victoria comparing 75%, 100%, 150% and 200% of the district practice for sowing rate. Initial findings indicated that poor seeder calibration and a lack of understanding of the influence of grain size has led to target plant densities not being reached. This highlights the need for sowing recommendations to be based on target plant densities rather than sowing rates. [20]

3.5 Calculating seed requirements

Key points:

- Plant more weight of triticale seed per unit area than when planting wheat. This is because triticale has larger seeds than does wheat.
- Adjust seeding rates to achieve targeted plant densities for specific triticale uses and conditions.
- Keep in mind that optimum seeding rates vary, depending on what the triticale will be used for.
- Choose and manage seeding rates to achieve target plant stand densities in the field.
- Triticale has the largest seed size of all common small-grained cereal crops. Ensure that your seed rate compensates for this.
- Rates are usually adjusted upwards when seeding forage mixtures or inter-cropped triticale.
- For mono-crop triticale forage production, recommended seeding rates are usually 25% higher than seeding rates for grain production.
- In two-component forage-crop blends using triticale, one guideline suggests each component consist of 75% of the normal seeding rate for the individual components alone. [21]

It is best to calculate the seeding rate using target plant population, germination percentage and seed count per kilogram, which is specified on the Seed Analysis Certificate (available on request when you purchase the seed). [22]

The desired plant density for triticale is 180 plants/m^2 up to 200 plants/m^2 in high rainfall zones. Depending on seed size this equates to a seeding rate of 75–100 kg/

19 NSW DPI District Agronomists (2007) Wheat growth and development, PROCROP Series, NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0008/516185/Procrop-wheat-growth-and-development.pdf

20 A Johnson, M Evans, K Wansink (2001) Challenging sowing rates for wheat to achieve target plant densities, 10th Australian Agronomy Conference, Australian Society of Agronomy/The Regional Institute Ltd, http://agronomyaustraliaproceedings.org/images/sampledata/2001/p/10/johnson.pdf

21 E Collier, L Oatway (2016) Triticale crop production, Alberta Agriculture and Forestry. http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/fcd10571

22 Waratah Seed Co Ltd (2010) Triticale: planting guide. http://www.porkcrc.com.au/1A-102_Triticale_Guide_Final_Fact_Sheets.pdf

ha. If sowing is delayed, or when sowing on light sandy soils, the higher plant density should be the target. [23]

Within limits, higher seeding rates in triticale lead to:

- higher crop yields
- better weed competition
- earlier maturity
- fewer tillers per plant
- shorter plant height

Seeding rates should generally be adjusted upwards for:

- large seed size
- low seed germination rate
- deep seeding (not a recommended practice)
- high moisture and yield potential conditions
- heavy textured soils
- rough seedbed
- heavy weed pressure conditions (especially in organic production)

Lower seeding rates may be suitable for dry conditions. Triticale does not tiller as freely as wheat, and has greater difficulty in compensating for low stand establishment. Use your own experience to adjust plant density targets to your local conditions. [24]

Because seed sizes may vary depending on production years and variety type, a fixed quote for the weight of seed needed to sow one hectare is not always an accurate measure for obtaining a desired plant population per hectare. Note that triticale has a much larger 1000 kernel weight than do other cereals. Average graded seed sizes are:

- large: 24,000 seeds/kg
- medium: 27,500 seeds/kg
- small: 30,000 seeds/kg

The formula in Figure 2 can be used to calculate sowing rates, taking into account:

- target plant density
- germination percentage
- seed size
- establishment, usually 80%, unless sowing into adverse conditions

To calculate 1000-seed weight:

- count out 200 seeds
- weigh to at least 0.1 g
- multiply weight (g) by 5 [25]

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

24 E Collier, L Oatway (2016) Triticale crop production, Alberta Agriculture and Forestry. http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/fcd10571

25 P Matthews, D McCaffery, L Jenkins (2014) Winter crop variety sowing guide 2014. NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/agriculture/broadacre/guides/winter-crop-variety-sowingguide

Example

1000 seed weight (grams)		target plant population (/m²)			establishment % X germination %
35	X	140	X 100	÷	80 X 90

= Your seedling rate 68 kg/ha

Your calculation

1000 seed weight (grams)		target plant population (/m²)			establishment % X germination %
______	X	______	X 100	÷	______

= Your seedling rate ______ kg/ha

Figure 2: *Seeding rate calculator.*

3.6 Sowing depth

Optimum planting depth varies with planting moisture, soil type, seasonal conditions, climatic conditions, and the rate at which the seedbed dries. The general rule is to plant as shallow as possible, provided the seed is placed in the moisture zone, but deep enough that the drying front will not reach the seedling roots before leaf emergence, or to separate the seed from any pre-emergent herbicides used. [26]

Recommended sowing depth for triticale ranges between 2–5 cm. [27]

When using triticale as a forage crop, sowing depth will depend on seasonal conditions, and the species and cultivar being sown. As a general rule, forage cereals are sown at an average depth of 3–4 cm. Sowing too deep can affect emergence, and shallow sowing can risk desiccation or damage from herbicide uptake. [28]

Triticale seed size is generally bigger than that of commonly grown wheat varieties. Consequently, triticale can be seeded deeper than other small cereals, and therefore benefit from stored moisture in the soil, which allows better crop establishment early in the season, particularly in drought-prone areas. Seeding equipment needs to be set to account for a seed that may be 10 to 20% larger than wheat.

Seed placement during the sowing process is very important when dealing with triticale cultivars. Triticale varieties equal—and in many cases exceed—the winter hardiness of the best wheats, if planted early during autumn and if planted shallowly (no more than 2.45 cm deep). At this depth, crops should see uniform seedling emergence and early weed competition. [29]

Shallow seeding allows for:

- more rapid emergence
- early vigour
- improved competition with weeds

26 NSW DPI District Agronomists (2007) Wheat growth and development, PROCROP Series, NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0008/516185/Procrop-wheat-growth-and-development.pdf

27 DAFWA (2015) Monitoring sowing depth, Department of Agriculture and Food, Western Australia. https://www.agric.wa.gov.au/mycrop/monitoring-sowing-depth

28 Agriculture Victoria (2012) Establishing forage cereals. http://agriculture.vic.gov.au/agriculture/dairy/pastures-management/forage-cereals/establishing-forage-cereals

29 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

Due to its large seed size, triticale is able to emerge from deep seeding. It usually results in decreased emergence and less plant vigour, however. [30]

Seed size influences coleoptile length, which is sensitive to sowing depth. Sowing depth influences the rate of emergence and the percentage that emerges. Deeper seed placement slows emergence; this is equivalent to sowing later. Seedlings emerging from greater depth are also weaker, more prone to seedling diseases, and tiller poorly (Photo 2).

Photo 2: *Reduced vigour with increased sowing depth.*

Source: DAFWA

Recent research has confirmed the importance of avoiding smaller-sized seed when deep sowing.

Crop emergence is reduced with deeper sowing because the coleoptile may stop growing before it reaches the soil surface, with the first leaf emerging from the coleoptile while it is still below the soil surface. As it is not adapted to pushing through soil (does not know which way is up), the leaf usually buckles and crumples, failing to emerge and eventually dying. [31]

For more information, see Section 4: Plant growth and physiology.

30 E Collier, L Oatway (2016) Triticale crop production, Alberta Agriculture and Forestry. http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/fcd10571

31 NSW DPI District Agronomists (2007) Wheat growth and development, PROCROP Series, NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0008/516185/Procrop-wheat-growth-and-development.pdf

3.7 Sowing equipment

The use of minimum soil disturbance has advantages for the production of triticale. One study noted a slight yield advantage for triticale grown under zero tillage. Seeding equipment needs to be set to account for a seed that may be 10 to 20% larger than wheat. [32]

As much as 60% of the final yield potential for a crop is determined at planting. Seeding too thinly, using poor quality seed, and uneven stands result in end-of-season yield losses that usually cannot be overcome. [33]

Seeder calibration is important for precise seed placement, and seeders need to be checked regularly during sowing (Photo 3).

Most growers in the Southern Region use either a knife-point/press-wheel tyne system or a single disc. Disc seeders can handle greater quantities of stubble but experience crop damage issues with pre-emergent herbicide use. Tyne seeding systems do not have the same herbicide safety issues but, in high stubble load situations, require some form of post-harvest stubble treatment, such as mulching or burning.

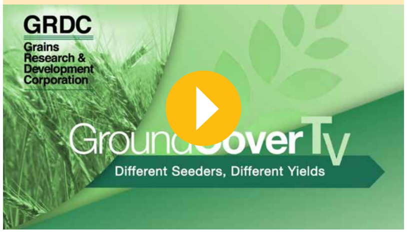
Photo 3: *Seeder calibration is important for precise seed placement and seeders need to be checked regularly during sowing.*

Photo: Rohan Rainbow

VIDEOS

WATCH: GCTV17: SFS seeder trial

WATCH: GCTV19: Different seeders different yields. Local R&D – valuable solutions for the HRZ grain growers



32 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

33 W Thomason (2004) Planting wheat: seeding rates and calibration. Virginia Cooperative Extension, http://www.sites.ext.vt.edu/newsletter-archive/cses/2004-10/plantingwheat.html