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GRDC
GROWNOTES™

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CEREAL RYE

SECTION 3

PLANTING

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

Planting

Key messages:

- The use of seed treatments is now routine, but it is important to check the product registration before use.
- A permit (APVMA Permit 82304) has been issued for imidacloprid seed treatment to control Russian wheat aphid in winter cereals. However, rye is less susceptible than wheat or barley to Russian wheat aphid. [1]
- Cereal rye compares favourably with other cereals for grazing when sown early.
- Depending on the crop purpose, soil type and climate, cereal rye can be sown from February until August.
- Sowing depth for cereal rye should not exceed five centimetres.
- Seeder calibration is important for precise seed placement and seeders need to be checked regularly during sowing.

3.1 Inoculation

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. 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 weeds such as stripe rust. Major losses from these diseases are now rare; however, this is due to the routine use of seed treatments. Seed not treated prior to sowing may result in yield losses as high as 85%.

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

- slowing the rate of germination, and
- 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. Some seed treatments contain azole fungicides (triadimenol and triadimefon). Research has found that these seed treatments can reduce coleoptile length, and that the reduction increases as the rate of application increases. [2]

Seed treatments provide targeted control of insect pests. They offer protection from low–moderate attack by insects at the establishment phase. They can delay or remove the need to apply foliar sprays and therefore in some instances can preserve beneficial populations. Seed treatments work by forming a chemical barrier over the surface of the germinating seed, which protects it from chewing insects (e.g. wireworms). Systemic seed treatments result in insecticide being translocated to the aboveground parts of germinating plants, deterring or killing pests such as aphids and mites. Although the duration of protection may be limited, a delay in crop damage and pest establishment can reduce crop losses.

1 G Baker, K Perry, M Nash, G McDonald, J Severi, P Umina (2106) Working with natural enemies and living with Russian wheat aphid a new pest of Australian cereal crops. GRDC Update Papers, August 2016, https://grdc.com.au/Research-and-Development/GRDC-Update-Papers/2016/08/Working-with-natural-enemies-and-living-with-Russian-wheat-aphid

2 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/0006/449367/Procrop-wheat-growth-and-development.pdf

Seed treatments for insect control can be used for:

- planting in conditions that make the seedlings more susceptible to insect damage, such as dry or cold and wet conditions
- sowing into fields where pests are known to be present and are difficult to control or detect before crop damage occurs (e.g. soil insects, earth mites)
- where crop losses cannot be tolerated, such as if seed is expensive or sown at a low rate per hectare. [3]

Seed treatments to control insect pests now include imidacloprid for Russian wheat aphid. [4]

Product registrations change over time and may differ between states and between products containing the same active ingredient. Prior to use, it is critical to check the registration status on the current product label for the intended use pattern in your state.

MORE INFORMATION

GRDC Fact Sheet: Targeted nutrition at sowing.

3.2.1 Fertiliser at seeding

The amount of nitrogen (N) that can be safely placed with the seed will vary depending on soil texture, amount of seedbed utilisation and moisture conditions. Higher amounts of N can be safely applied with the seed if it is a polymerised form of urea, where the N 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. Nitrogen can be banded prior to seeding, but take care to avoid loss of seedbed moisture and protective crop residue. Place phosphorus with or near the seed at seeding time. [5]

3.3 Time of sowing

Rye for grain is sown at the same time as wheat, oats or barley (May or June). However, it is often sown first because rapid groundcover is usually desirable on the soils where it is sown.

Cereal rye is adapted to all soils. Its major fit is on the lighter acid soils where yields are usually 70–100% those of wheat and triticale when sown between May and June.

On the more traditional wheat soils, cereal rye yields are about 50–70% those of wheat. When sown late (in July) and in dry springs, yields are often less than 50% of comparable wheat yields. Although it heads early, its longer grainfilling period and later maturity limit its performance in the western areas of the northern grain belt.

When sown early, cereal rye compares very favourably with other cereals for grazing in terms of quick feed and total dry matter production. Crops for grazing can be sown in March or April. [6]

For the purposes of green manure, cereal rye can be sown February or March or as late as August in high-rainfall areas. [7]

3 QDAF (2016) Seed dressings or treatments. IPM guidelines for grains. Queensland Department of Agriculture and Fisheries/GRDC, http://ipmguidelinesforgrains.com.au/ipm-information/chemical-control/seed-dressings-treatments/

4 Agriculture Victoria (2016) Russian wheat aphid. Victorian Government EDJTR, http://agriculture.vic.gov.au/agriculture/pests-diseases-and-weeds/plant-diseases/grains-pulses-and-cereals/russian-wheat-aphid

5 Alberta Government (2016) Fall rye production. Alberta Agriculture and Forestry Agdex 117/20-1, http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex1269/$file/117_20-1.pdf

6 P Matthews, D McCaffery, L Jenkins (2016) Winter crop variety sowing guide 2016. NSW Department of Primary Industries, https://www.dpi.nsw.gov.au/agriculture/broadacre-crops/guides/publications/winter-crop-variety-sowing-guide

7 R Sonogan (2013) Growing cereal rye. Agriculture Victoria, May 2013, http://agriculture.vic.gov.au/agriculture/grains-and-other-crops/crop-production/growing-cereal-rye

3.4 Targeted plant population

Target 120–150 plants per m^2 for grazing and grain crops, or a seeding rate of ~60–70 kg per hectare (kg/ha) depending on seed size. Higher populations are needed for green manure crops. [8]

IN FOCUS

Effect of seeding rate and planting arrangement on rye cover crop and weed growth in the US.

Weed growth in winter cover crops in warm climates may contribute to weed management costs in subsequent crops. A two-year experiment was conducted on an organic farm in the United States to determine the impact of seeding rate and planting arrangement on rye cover crop growth and weed suppression. Each year, rye was planted at three rates (90, 180, and 270 kg/ha) and two planting arrangements (one-way *v.* grid pattern). Averaged across years, rye population densities were 322, 572, and 857 plants/m^2 at the 90, 180, and 270 kg/ha seeding rates, respectively. Early-season rye groundcover increased with seeding rate and was higher in the grid than one-way arrangement in Year 1; however, rye groundcover was not affected by rate and was higher in the one-way arrangement in Year 2. Aboveground dry matter (DM) of rye increased with seeding rate at the first two harvests but not at the final one. Planting arrangement did not affect rye aboveground DM in Year 1, but rye DM was higher in the grid pattern at the first and final harvests in Year 2. Weed emergence was not affected by seeding rate or planting arrangement. Weed biomass decreased with increased seeding rate and was lower in the grid than in the one-way arrangement in Year 2. A grid planting pattern provided no consistent benefit but planting rye at higher seeding rates maximises early season rye DM production and minimises weed growth. [9]

3.5 Calculating seed requirements

Sowing rates vary with seed size, target plant populations and establishment percentage. As a guide, comparative seed rates for grazing and grain crops are 60–70 kg/ha and green manure 80–100 kg/ha. [10]

Cereals can lodge under good conditions or if sown at too high a density. [11] Rye is tall and lodging is an issue, with some varieties more prone to lodging. [12]

The formula in Figure 1 can be used to calculate sowing rates, taking into account:

- target plant density
- germination percentage
- seed size

8 P Matthews, D McCaffery, L Jenkins (2016) Winter crop variety sowing guide 2016. NSW Department of Primary Industries, https://www.dpi.nsw.gov.au/agriculture/broadacre-crops/guides/publications/winter-crop-variety-sowing-guide

9 NS Boyd, EB Brennan, RF Smith, R Yokota (2009) Effect of seeding rate and planting arrangement on rye cover crop and weed growth. AgronomyJournal, 101(1), 47–51, https://dl.sciencesocieties.org/publications/aj/abstracts/101/1/47?access=0&view=pdf

10 P Matthews, D McCaffery, L Jenkins (2016) Winter crop variety sowing guide 2016. NSW Department of Primary Industries , https://www.dpi.nsw.gov.au/agriculture/broadacre-crops/guides/publications/winter-crop-variety-sowing-guide

11 L Forsythe, K McKee (2013) Moddus Evo: Controlling plant growth for reduced lodging and improved yields. GRDC Update Papers, February 2013, https://grdc.com.au/resources-and-publications/grdc-update-papers/tab-content/grdc-update-papers/2013/02/controlling-plant-growth-for-reduced-lodging-and-improved-yields

12 P Matthews, D McCaffery, L Jenkins (2016) Winter crop variety sowing guide 2016. NSW Department of Primary Industries, https://www.dpi.nsw.gov.au/agriculture/broadacre-crops/guides/publications/winter-crop-variety-sowing-guide

- 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. [13]

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 1: *Seeding rate calculator.*

Source: NSW DPI Winter crop variety guide

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. 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 (Figure 2). This highlights the need for sowing recommendations to be based on target plant densities rather than sowing rates. [14]

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, and so that the seed is separated from any pre-emergent herbicides used. 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. [15]

13 P Matthews, D McCaffery, L Jenkins (2016) Winter crop variety sowing guide 2016. NSW Department of Primary Industries, https://www.dpi.nsw.gov.au/agriculture/broadacre-crops/guides/publications/winter-crop-variety-sowing-guide

14 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://www.agronomyaustraliaproceedings.org/images/sampledata/2001/p/10/johnson.pdf

15 NSW DPI (2007) Wheat growth and development. PROCROP Series. NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0006/449367/Procrop-wheat-growth-and-development.pdf

Research in Canada has shown that rye sown at 2.5 cm depth had twice the emergence of that sown at ~5 cm and that shallow-seeded rye had greater winter hardiness. [16]

Sowing depth for cereal rye should not exceed 5 cm. Bevy rye has a smaller seed size than wheat and it should be sown shallower, at 2–2.5 cm depth in heavy soils and 3.5–4.5 cm in sands. [17]

Research has confirmed the importance of avoiding smaller sized seed if 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. The leaf usually buckles and crumples, failing to emerge and eventually dying. This is exacerbated in smaller seeded varieties with reduced coleoptile length. [18] [19]

The rye plant has four primary roots that originate from the seed and it can send out roots and tillers from the second, third and fourth node. This extensive root system within the first 30 cm of soil is more developed than other cereals, and is useful when sowing over eroded or disturbed sites where depth is hard to control. [20]

3.7 Sowing equipment

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 cannot usually be overcome. [21]

Seeder calibration is important for precise seed placement and seeders need to be checked regularly during sowing (Photo 1).

Many growers 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 usually require some form of post-harvest stubble treatment, such as mulching or burning.

Photo 1: *Seeder calibration is important for precise seed placement and seeders need to be checked regularly during sowing.*

Source: Rohan Rainbow

VIDEOS

WATCH: Over the Fence north: conditions are key to accurate seed placement.

16 Alberta Government (2016) Fall rye production. Alberta Agriculture and Forestry Agdex 117/20-1, http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex1269/$file/117_20-1.pdf

17 R Sonogan (2013) Growing cereal rye. Agriculture Victoria, May 2013, http://agriculture.vic.gov.au/agriculture/grains-and-other-crops/crop-production/growing-cereal-rye

18 N Lee (2015) Think big when deep sowing wheat. GRDC Media, May 2015, https://grdc.com.au/Media-Centre/Media-News/West/2015/05/Think-big-when-deep-sowing-wheat

19 DPI NSW (2007) Wheat growth and development. PROCROP Series. Department of Primary Industries New South Wales, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0006/449367/Procrop-wheat-growth-and-development.pdf

20 L Martin (2015) Growing cereal rye to increase carbon and prevent wind erosion. Liebe Group, March 2015, http://www.liebegroup.org.au/wp-content/uploads/2015/03/Case-Study-Jeff-Pearse-March-2015.pdf

21 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