



Forage oat agronomy guide

Forage oats is the preferred winter forage crop for beef and dairy cattle in Queensland, due to its ability to produce good-quality feed when most pastures are dormant. Many farmers rely on oats to fatten livestock during the period from autumn to early spring. Leaf rust is the most serious disease of forage oats, reducing yield, quality and palatability. The use of improved varieties and better management practices are the key factors to increasing the level of productivity of oat crops.

This guide discusses the recommended management practices for growing oats for forage and strategies to minimise leaf rust infection.

Planting

Optimum planting time for forage oats is from mid March to June in southern Queensland and northern New South Wales, and early April to June in central Queensland. Avoid planting before the start of April in central Queensland. Planting too early or too late can reduce forage yield. Late planting will hasten maturity and reduce the potential for multiple grazing. However, late planting may be a suitable practice for hay production. Oats for grain and seed are best planted in May to June.

The recommended planting rates are 40–60 kg/ha in southern Queensland and northern New South Wales, and 25–40 kg/ha in central and western Queensland. The recommended planting rate for irrigated crops is 55–60 kg/ha. Planting rates should be adjusted for germination, seed size and percentage establishment in the field. Planting rates can be increased by 20% for late planting, planting under hot conditions, or where there is a weed problem. Farmer-saved seed and carry-over seed from the previous season should be tested for germination prior to planting. There are approximately 50 000 seeds per kilogram, but always check the seed container for the correct seed size and germination rate.

The optimum soil temperature for the germination and establishment of oats is between 15 °C and 25 °C. Avoid planting into warm or hot soils, as soil temperatures above 25 °C during the period from January to March will reduce seed germination and result in poor crop establishment.

Oat seed is best sown at 5–7.5 cm depth in row spacing of 18–25 cm, into moist soil in a well-prepared seedbed.

Nutrition

Ensure the crop receives adequate fertiliser and weed control. Forage oats will grow on most soils but will not provide good recovery on strongly acidic soils or wet soils that develop aluminium and manganese toxicities. Most oat varieties grown on poor soil (e.g. low in nitrogen) could develop red-tipping (see Figure 1 overleaf) on the leaves and this may result in below-optimum yields.

Nutrition requirements and fertiliser rates are similar to those recommended for wheat nutrition. Starter fertiliser at sowing is recommended, but should be applied separately to the seed as the fertiliser can damage the seed and reduce its germination (Table 1).

An application of nitrogen after grazing (20–40 units of nitrogen per hectare) will increase the speed of plant recovery, reduce tiller death and increase overall forage yield.

Table 1 Suggested safe rates (kg/ha) of some nitrogen fertiliser products sown with oat seed at planting

Row spacing		Maximum nitrogen rate	Urea	DAP	MAP
cm	in				
18	7	30	65	158	230
36	14	15	33	79	115

Red-tipping

Red-tipping of leaves is usually a symptom of nutrient deficiency on grazing oats. It is associated with low levels of nitrogen, phosphorus, potassium, zinc or sulphur in the soil. Nitrogen deficiency is the most common cause. Red-tipping is not a symptom of rust infection.

The reddish colour, seen mostly on the tips of mature leaves, is caused by the presence of a purple-red pigment called anthocyanin. The intensity of the redness varies with the season. Early stages of the disorder show light-yellow veins running parallel to the midrib of the leaf. In the later stages, the tips turn red. In cold, dry winters the colour deepens to almost purple, while in mild, wet winters it is a more washed-out orange-red.

Affected plants are slightly stunted and less palatable for livestock. Red-tipping tends to occur over large areas of the crop where fertiliser application has not been adequate. Red-tipping can also be confused with barley yellow dwarf virus. Red-tipping is more common than barley yellow dwarf virus in Queensland.

Red-tipping can be avoided by practising good crop nutrition. In paddocks with a history of this problem, increase nitrogen rates to 70–80 kg of nitrogen per hectare and check whether other nutrients are adequate. Top-dressing can be used to correct the problem, but good rainfall after application is necessary and, as a consequence, results can be erratic.



Figure 1 Red-tipping in oats

Grazing

Intermediate and late-maturing varieties remain vegetative until late in the season and provide a longer duration of grazing for livestock.

If possible, first grazing should be delayed until secondary roots are well established and before stems begin to elongate. Grazing can commence when there is enough root development to ensure plants will not be pulled out. This usually corresponds with about 25 cm of growth for upright types and 10–15 cm for prostrate varieties.

For quick recovery, do not graze too low. Where possible, only graze down to the height of the lowest stem node—about 12–15 cm (5–6 inches) above ground level. Avoid hard grazing, as this can remove the growing points and delay subsequent regrowth. Also avoid grazing the crop when the soil is very wet, as the crown and root will be damaged and regrowth will be slow and reduced.

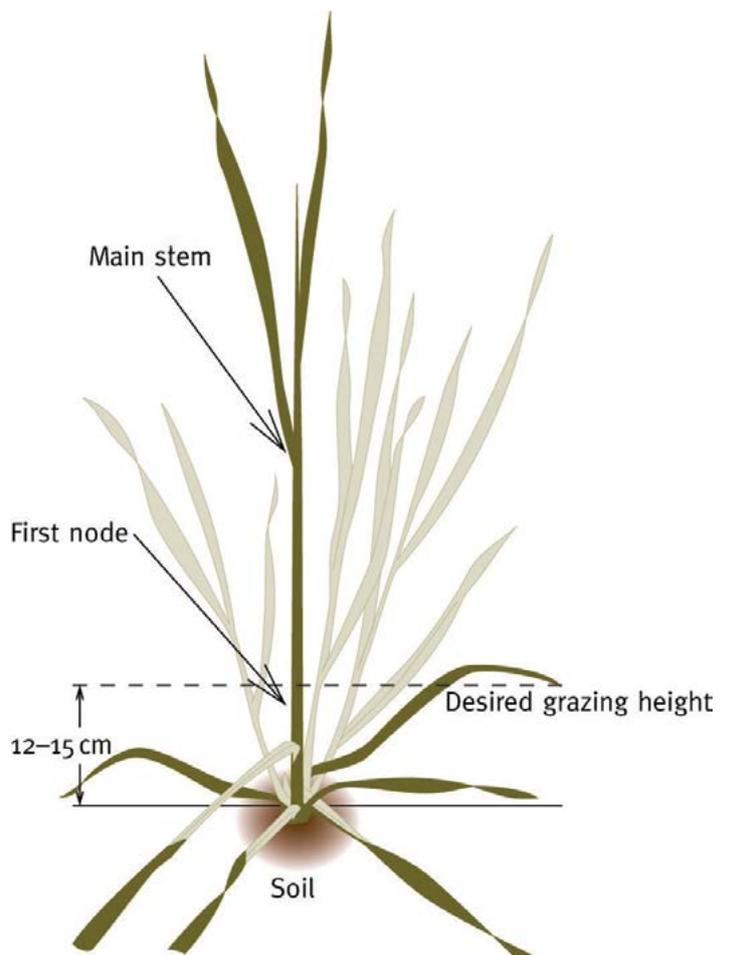


Figure 2 Recommended grazing height for forage oats

Continuous grazing

With continuous grazing, stock remain on the forage oats for the entire feeding period and may or may not have access to alternative pasture. This is an easy management option that allows stock greater opportunity to select the young nutritious growth and maximises weight gain per head. In contrast, however, there is less efficient use of oats due to trampling and reduced regrowth potential.

Rotational grazing

Rotational grazing involves regularly moving stock between two or more oat paddocks, which allows the oats to regrow between grazing. Dryland oat crops can be grazed several times depending on rainfall, irrigation, nitrogen and timeliness and severity of grazing.

Strip grazing

Strip grazing is common on dairy farms where electric fences control stock access. It is used to minimise trampling losses, increase crop utilisation (less selection) and encourage regrowth for greater forage production. Fertilising following grazing is an option with irrigation or favourable rainfall.

Stocking rates

Suggested carrying capacities for fattening steers include:

- dryland—black soil—2 animals per hectare
- dryland—light soil—1.5 animals per hectare
- irrigation or favourable dryland—up to 5 animals per hectare.

Expected weight gains include:

- general range—0.7–1.2 kg per day
- weaner/yearling cattle—0.7–1.1 kg per day (average 0.9 kg)
- heavy steers (export)—0.8–1.2 kg per day (average 1.0 kg).

Scouring

Reduce scouring on oats by allowing stock access to roughage or introducing stock gradually by limiting grazing time. Ensure cattle are not hungry when going onto a new feed.

Scouring is commonly seen on oats and is caused by a massive change in the diet from a dry, fibrous pasture to a lush, high-moisture (70–80%) grazing crop. Initially, the digestive system is purged, causing a loss of gut fill and a fast passage of feed. Also the rumen bacteria need time to adapt to the new feed. Cattle may lose condition and it often takes a few weeks for cattle to commence high weight gains.

Some methods of reducing scouring are allowing access to dry pasture, providing hay or limiting initial grazing times on forage oats if practical (e.g. 1 hour for first 4–7 days).

Haymaking

Some forage oat varieties are also suitable for haymaking. Cutting at the milky dough stage of grain fill will produce the highest yield of good-quality hay. Choose a variety with intermediate maturity, medium stem thickness and a high leaf-to-stem ratio. After multiple cuts, the stems may increase in thickness. A high sowing rate (up to 80 kg/ha) will improve the quality of hay by helping to reduce the thickness of stems.

Oaten hay for the export market should be free of visible damage due to leaf and stem rust.

Diseases

Leaf rust

Leaf rust of oats (*Puccinia coronata*) is closely related to leaf rust of wheat and barley, and has similar characteristics, but will only infect oats.

Spores are windborne, can spread over large distances through the air and will survive over summer on volunteer oats and wild oats.

This disease is most severe under mild temperatures and moist conditions (e.g. in early autumn and early spring after wet, overcast conditions). This disease will build up very quickly on susceptible varieties. It will complete its life cycle and re-infect new leaves every 2–3 weeks.

The symptoms are small, light orange-yellow pustules, appearing about 7–10 days after infection (Figure 3). Leaf rust mostly occurs on leaves and leaf sheaths, but also occurs on stems. It is seen first on the lower leaves and then spreads to the upper canopy.



Figure 3 Leaf rust on oats

When severe, leaf rust can dramatically reduce forage yield, and reduce forage quality and palatability (Figure 4). Even at a low level of infection, leaf rust on the lower leaves can cause some yield loss and can spread to the upper leaves later in the season.

Resistant varieties are available, but new varieties are often overcome by new pathotypes or races of leaf rust. Many different races of leaf rust are present in Australia, and each race will often occur on only one variety.



Figure 4 Leaf rust-resistant variety (left) alongside leaf rust-susceptible variety (right)

Stem rust

Stem rust (*Puccinia graminis*) is similar in appearance and can often be confused with leaf rust. However, stem rust is less important on grazing oats since it occurs later in the growing season after most of the crop has been consumed. Stem rust can cause major yield loss in forage oat crops grown for seed or hay production.

Stem rust is most severe under warm temperatures and moist conditions, and infection levels are highest in late spring and summer. Spores are windborne, can spread over large distances through the air and will survive over summer on volunteer oats and wild oats.

The symptoms are large, dark red-brown pustules (Figure 5), appearing about 7–10 days after infection. Stem rust mostly occurs on stems, but will also appear on leaves and seed heads.

No resistant varieties are available—all varieties in Australia are susceptible. As with leaf rust, many different races of stem rust are present in Australia.



Figure 5 Stem rust on oat stems (left) and oat leaves (right)

Bacterial blight

The initial symptoms of bacterial blight (*Pseudomonas syringae*) are light-green, water-soaked oval spots (Figure 6). Spots will develop into brown, water-soaked blotches (sometimes halos) or brown, elongated stripes. Stripes and blotches can merge to cause leaf crimping and leaf death.

The disease spreads by raindrop splash or mechanical means, and survives on seed and plant stubble. Bacterial blight is controlled by grazing to remove infected plant tissue (seed treatment is not effective).



Figure 6 Bacterial blight on oats

Septoria blotch

The symptoms of septoria blotch (*Septoria avenae*) first appear on leaves as small, dark-brown spots. Spots develop into larger, oval-shaped blotches surrounded by light-brown margins. Infection may spread to the leaf sheaths and stems resulting in lodging.

The disease appears in autumn and spreads rapidly in cool, rainy weather. The disease spreads by raindrop splash or mechanical means, and survives on plant stubble. It rarely causes yield loss, but will reduce visual quality of hay.



Figure 7 Septoria blotch on oats

Barley yellow dwarf virus

Barley yellow dwarf virus (BYDV) is a viral disease spread by aphids and can cause significant yield loss in susceptible varieties. BYDV is more common in northern New South Wales than in Queensland. The disease is favoured by mild, moist autumns that allow aphid populations to build up.

The stems, leaves and roots of infected plants become stunted and leaves turn pale-green with reddish tips. Later in the season, panicles have a blasted appearance with white and sterile florets. BYDV most often occurs as 'hotspots' in a forage oat crop.

Insecticidal seed dressings can be used to control aphids in the seedling stage and reduce BYDV infection. Control of alternate aphid hosts and good crop nutrition will prevent infection and reduce yield loss.



Figure 8 Barley yellow dwarf virus on oats

Covered smut and loose smut

In plants infected with covered smut (*Ustilago hordei*) or loose smut (*Ustilago avenae*), the individual oat grains are replaced with powdery, black spore masses. The smut-infected heads can be seen as soon as the heads emerge from the boot, and the spores are easily transported by wind.

Any seed that may be used for seed crops should be treated with a suitable fungicide before planting. Check to see if seed has been treated. If not, dress with Vitavax, Vitaflo or another registered seed treatment. Check the chemical label for details.



Figure 9 Loose smut on oats

Management of leaf rust

The frequency and severity of losses from leaf rust infection can be reduced by a range of management strategies.

Grazing management

Losses from leaf rust can be reduced by grazing or cutting rusted crops as early as possible once leaf rust is conspicuous below the top two leaves on each tiller and before the disease becomes severe. Given suitable conditions, it takes 7–14 days for a rust spore to infect and produce more spores. During this period, oat plants will normally produce several new leaves on each tiller. During active growth of the crop, the upper canopy may remain free of rust symptoms. Therefore, it is necessary to regularly inspect the crop to monitor rust occurrence. If leaf rust is obvious below the top two leaves on each stem, the crop should be grazed or cut regardless of growth stage.

Cultivar selection

Select cultivars with good resistance to leaf rust. Although new varieties often become susceptible to rust after commercial release, there are normally one or two resistant varieties available for commercial sale.

Select high-yielding cultivars with late maturity. Recent forage oat varieties releases are much higher yielding and much later to flower than the older dual-purpose varieties. Recent varieties will produce more forage yield over time, even when infected with leaf rust. Leaf rust is rarely a problem through the whole season, so late flowering varieties will provide a longer grazing window and will recover multiple times from grazing.

Planting time

Avoid planting too early (before mid March) or too late (after June) to reduce the risk of young crops becoming infected. The conditions promoting leaf rust development are most likely to occur in late summer and autumn, and again in spring and early summer. Thus, sowing too early (before mid March) or too late (after June) will increase the risk of young crops becoming infected and provide a source of inoculum. This cycle can be broken (e.g. by delaying sowing until after mid March, exposure to leaf rust is reduced early in the season and crops are still able to attain adequate growth before winter).

Crop hygiene

Control volunteer oat plants and wild oats. Both leaf and stem rust survive over summer between cropping seasons on wild oats and volunteer oat plants, providing a continual supply of spores for fresh rust outbreaks each year.

Row width

Planting in wider rows may reduce the level of infection by lowering the humidity inside the crop canopy. It will also have the added benefit of reducing losses from trampling.

Nutrition

Maintaining good soil nutrition and adding extra nitrogen will minimise the effects of leaf rust. Nutrition requirements and fertiliser rates are similar to those recommended for wheat nutrition. Starter fertiliser at sowing is recommended, but should be applied separately to the seed as the fertiliser can damage the seed and reduce its germination.

Fungicide

A number of fungicides are registered for control of leaf rust on forage oats in Queensland (Table 2). Application of fungicide is more likely to be economically beneficial when infection levels are moderate to high (e.g. greater than 20% leaf area infected), or when crops are grown under irrigation and good dryland conditions. The use of fungicide is also beneficial in higher value crops grown for seed and hay. However, the application of fungicide to susceptible forage cultivars with low levels of leaf rust (0–10% leaf area infected) is unlikely to be economically beneficial, particularly when crops are growing under tough dryland conditions.

All registered fungicides have a withholding period from grazing of 7–14 days after spraying, so livestock producers need to avoid problems caused by chemical residue. Fungicides should be applied as soon as there is sufficient leaf area to ensure good uptake of the active ingredient. This would normally be 7–14 days after grazing, assuming sufficient soil moisture to promote recovery from grazing. Grazing should then commence only after the withholding period has expired, but this would normally be less than the time required for the crop to recover for further grazing.



Table 2 Commercially available foliar fungicides for control of rust disease in cereals in Australia

Product name	Active ingredient	Company	Indicative cost	App. rate (per ha)	App. cost	Withholding period (grazing)	Registered for oats
Tilt 250SC	Propiconazole	Syngenta + Generic	\$14/L	500 mL	\$7/ha	7 days	Yes
Folicur 430SC	Tebuconazole	Bayer + Generic	\$13/L	290 mL	\$4/ha	14 days	Yes
Prosaro 420SC	Prothioconazole + Tebuconazole	Bayer	–	300 mL	–	14 days	Yes
Tilt Xtra	Propiconazole + Cyproconazole	Syngenta	\$46/L	500 mL	\$23/ha	21 days	No
Amistar Xtra	Azoxystrobin + Cyproconazole	Syngenta	\$54/L	800 mL	\$43/ha	21 days	No

Seed production

Grain oats are less important in Queensland and northern New South Wales because no grain varieties are available with stem rust resistance and adaptation to the warmer growing conditions. Forage oat crops can be harvested for grain in Queensland and northern New South Wales, but the harvested grain is usually used for planting seed in the following season.

Both leaf and stem rust are major constraints for oat grain and seed production. These diseases can be severe under favourable conditions. Stem rust causes pinched grain, resulting in low seed vigour and poor germination. If the seed is poor, it may be unsuitable for planting, and commercially sourced seed should be sown in preference.

The expected grain yield is 1–1.5 t/ha (with grain density 50 kg per hectolitre) for dryland cropping on the eastern Darling Downs. Grain yield can be maximised by planting later in the season (May or June) to reduce forage growth prior to flowering. To minimise the potential for lodging prior to harvest, plant populations can also be significantly reduced to less than half the normal rate.

Heavy grazing of forage oats will markedly reduce the potential for grain yield. Oat crops respond best to regular quick grazing, occurring in the early vegetative stage well before the first node or joint in the tiller can be detected. When a crop is intended for grain harvest, grazing should not continue beyond the end of July.

More information

For more information, contact the Department of Agriculture and Fisheries (DAF) on 13 25 23 or visit daf.qld.gov.au.

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