Stubble Management Guidelines



Yellow leaf spot (YLS) occurs commonly in stubble-retained systems. Photo: Hugh Wallwork (SARDI).

Yellow leaf spot (YLS) is a disease caused by the fungal pathogen *Pyrenophora tritici-repentis*. In the Upper North region of South Australia, YLS primarily affects bread wheat varieties.

Initial symptoms of the disease appear on the leaves as small tancoloured spots with discrete yellow halos surrounding them. As the lesions grow they can vary in size and shape and can join together. When a leaf is severely affected its tip will turn yellow and die.

Occasionally when infection occurs after flowering, because of wet conditions during spring, pink pigmentation can develop in plant stems and seeds. Affected seed can be downgraded.

Infection by YLS is a two-stage process and is heavily dependent on the weather. A primary infection of seedlings is quite common, but this does not always mean a secondary and more significant infection will occur later on. For YLS to transfer upwards through the canopy to affect the top leaves and impact significantly on yield, frequent, and often prolonged, rainfall events are required. If these conditions are present, however, the disease can rapidly spread through the canopy and become more difficult to manage due to the constant production of spores from the stubble and lower leaves.



Yellow Leaf Spot

Key facts

- » Yellow leaf spot (YLS) disease primarily affects bread wheats and is most common in stubble-retained systems.
- » Symptoms appear as tan-coloured spots with yellow edges along the leaves.
- » The fungus kills plant tissue before feeding on it, preventing fungicides from travelling to the sites of infection.
- » Yield losses are usually lower than 15 per cent, but can be considerably higher if conditions favour the disease.
- » Avoid sowing susceptible wheat varieties into infected stubble.

Project information

This Yellow Leaf Spot management guideline has been developed for the Upper North Farming Systems Group (UNFS) as part of the Maintaining Profitable Farming Systems with Retained Stubble Initiative, funded by the Grains Research and Development Corporation (GRDC UNF00002).

The Stubble Initiative involves farming systems groups in Victoria, South Australia and southern and central New South Wales, collaborating with research organisations and agribusiness, to address challenges associated with stubble retention.

The GRDC, on behalf of growers and the Australian Government, is investing \$17.5 million in the initiative that has been instigated by the GRDC Southern Regional Panel and the four Regional Cropping Solutions Networks that support the panel.









Disease symptoms appear on the leaves as tan-coloured spots with yellow halos. Image courtesy of Frank Henry, Agriculture Victoria, DEDJTR.



LEFT: Black fruiting bodies on stubble. Image courtesy of Mark McLean, Agriculture Victoria, DEDJTR.



Tips of severely affected leaves die. Photo: Hugh Wallwork (SARDI).

Diagnosis

The yellow leaf colouring caused by YLS can be confused with symptoms caused by other issues, such as nitrogen deficiency, zinc deficiency or damage from herbicides, so it is important to diagnose the problem correctly.

Some wheat varieties, including those released by Australian Grain Technologies (AGT), can also demonstrate leaf yellowing in certain conditions, for example during wet and cold periods.

Biology

Because the fungal pathogen persists on crop stubble and plant residues, YLS is most commonly an issue in paddocks where minimum tillage and stubble retention are practiced. When conditions are particularly dry, the fungus can survive on stubble for up to two years, although its viability decreases after 18 months.

The fungus has a short life cycle, and after infecting a plant will take only 4–7 days to produce visible lesions on the leaves.

The spread of the infection can be a two-stage process, with two different types of inoculum being generated by the fungus.

Primary infection

During autumn and winter the fungal infection produces black, pinhead-sized, elevated fruiting bodies, with hairlike projections that cause them to feel rough when touched. Clusters often form on stem nodes. When wet, the fruiting bodies swell and expel microscopic spores over a distance of roughly 100mm. These spores cause lesions to develop on any seedlings they touch. This comprises the initial spread of the infection.

Secondary infection

The lesions that develop as a result of the primary spread of the fungus produce spores, called conidia. Conidia are dispersed by wind and can travel significant distances. Conditions are optimal for infection where leaves remain wet for six or more hours and the temperature falls in the range of 15-28°C. This secondary spread is the main cause of rapid disease development through the crop, leading to high yield losses. The secondary infection can also be exacerbated in the middle of the growing season by cold conditions, which slow plant development and prevent leaves from growing away from the infection sites.

The YLS fungus feeds on dead and decaying plant matter. During infection, the fungus secretes toxins into the cells of the host plant, causing them to die. This is why the lesions appear as a tan-coloured section of dead plant material surrounded by yellow rings of dying cells.

Because the fungus kills the plant cells, fungicides cannot move through the dead cells to protect the rest of the plant. This drastically reduces the efficacy of fungicides applied after infection has been initiated.

The fungus can also feed on already dead plant material. This increases the susceptibility of bread wheat varieties as they 'dry off', regardless of their resistance rating. It also means other crops and stubbles, such as barley and oats, can host and spread the fungus, even though they are immune from the disease while green.



Assessing the risk

When managing YLS, first assess the situation and gauge the risk. Management in-season is difficult, so pre-sowing management is critical.

Disease presence

YLS is most commonly a problem in paddocks where wheat is being sown into wheat stubble — particularly when the new crop is a susceptible variety. Infected stubble can continue to spread the disease throughout the growing season, so take care to choose a more resistant wheat variety when sowing into potentially infected stubble.

When assessing paddocks for risk of infection, bear in mind that YLS from infected stubble is unlikely to spread to adjacent paddocks without particularly wet and windy weather. Although the fungus can be spread by wind, it is not as mobile as other fungi, such as stripe rust. Since the fungus is usually located in the lower canopy of the crop, this can also trap it in that year's crop and help prevent its spread. Although it can quickly spread through a paddock, YLS is not so easily transferred to new paddocks.

Crop type and variety

Although cereals other than wheat can host YLS as they dryoff or are retained as stubble, the disease is really only a major threat to bread wheat varieties. As such, carefully consider a wheat variety's susceptibility before sowing, especially if it is being sown into potentially-infected stubble (see Table 1).

Reducing yield losses

Yield losses resulting from YLS are usually less than 15 per cent, but if conditions favour its spread, the losses can be significantly higher.

Crop rotation and variety choice are the main strategies to manage YLS in the Upper North.

Crop selection

Avoid sowing susceptible crop varieties into infected stubble, particularly if the existing inoculum load is moderate to high. Usually a one-year break from a non-host crop will reduce the inoculum load by as much as 95 per cent, provided the stubble is sufficiently broken down.

If sowing a wheat crop into infected stubble, select a variety with some degree of resistance to YLS (at a minimum it should have a rating of MR–MS). If the variety is susceptible, gauge how much inoculum is present in the paddock before sowing so the infected stubble can be managed accordingly (see Table 1).

Crop nutrition

Healthier, more vigorous crops cope better with infection. Soil tests before sowing and tissue tests during the growing season can support effective fertiliser decisions.

Under Upper North conditions, if a crop is infected, nitrogen and zinc applications are often a cost-effective method to manage YLS. Although this will not remove the fungus, nutrient applications can 'green up' the crop sufficiently to lessen the potential yield loss.

TABLE 1. Yellow leaf spot disease rating for a range of bread
wheat varieties grown in South Australia*

Bread wheat variety	Yellow leaf spot disease rating in South Australia
AGT Katana	MS
Arrow	possibly MR
Ахе	S
Chief	possibly R-MR
Cobra	MS
Corack	MR-MS
Cosmick	MR-MS
Cutlass	MS-S
DS Darwin	S
Emu Rock	MR-MS
Gladius	MS
Grenade	S
Hatchet	S
Justica	S-VS
Kord	MS-S
Масе	MR-MS
Scepter	possibly MR-MS
Scout	S-VS
Shield	MS
Trojan	MS-S
Yitpi	S-VS

S = susceptible, VS = very susceptible, MS = moderately susceptible, MR = moderately resistant.

Source: South Australian Crop Variety Sowing Guide (GRDC, 2017).

Stubble management

Burning and grazing can be effective control methods to remove infected stubbles, but need to be balanced against the other effects of removing stubble, including increased erosion risk.

Cultivation to incorporate stubble is another option, but any infected stubble remaining on the soil surface will generate fungal spores and infect the new crop. Cultivation can also spread other diseases associated with stubble, such as crown rot.

Fungicides

Prosaro[®], Amistar Xtra[®] and fungicides containing the active ingredients propiconazole and tebuconazole are registered for YLS control, but often will have low efficacy because of the nature of the disease. Given typical Upper North yields, these fungicides are unlikely to be cost effective.

Yellow Leaf Spot



As YLS lesions grow, they can vary in size and shape and can join together. Photo: APS Press.

References and further information

- Herbiguide yellow leaf spot of wheat fact sheet
 (2014) Click
- » Managing yellow leaf spot with fungicide and genetic resistance (2014) AGT guidelines Click
- » Diagnosing yellow leaf spot of wheat (2016) WA Department of Agriculture and Food Click
- » Yellow leaf spot of wheat (2014), Agriculture Victoria information note Click
- » Yellow leaf spot (2011) GRDC Southern Region fact sheet Click

- » Yellow leaf spot is it worth spraying? (2013) GRDC Update paper Click
- » Management of yellow spot in wheat: decide before you sow (2013) GRDC Update paper Click

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