MANAGING SEPTORIA TRITICI BLotch DISEASE IN WHEAT

Changes in Septoria tritici blotch resistance to fungicides have been detected in the southern grain growing region, especially where wheat is sown into wheat stubble. Variety selection and crop rotations are essential for effective disease control.

KEY POINTS

- Distinctive black fruiting bodies on leaf lesions are a good indicator for diagnosis of Septoria tritici blotch (STB) infection.
- Long periods of leaf moisture are required for disease development.
- Early sown crops and crops sown into wheat stubbles are most likely to be infected.
- Two gene mutations in STB detected by NSW Department of Primary Industries indicate resistance to some fungicides (see Case Study).
- Adoption of an integrated disease management approach that includes crop rotation and, when necessary, applied fungicides is the most effective management tool.

What is Septoria tritici blotch?

Septoria tritici blotch (STB) is caused by a fungus, Zymoseptoria tritici (synonym Mycosphaerella graminicola, Septoria tritici), which survives in wheat stubble. Initial infection arises from ascospores produced within fruiting bodies, called pseudothecia, on the stubble. These windborne spores can travel over long distances. Secondary, short distance dispersal is caused by different spores, called conidia, which are produced on the infected leaves. These are predominantly splash dispersed by raindrops.

Host range

The fungus can infect all bread wheat, durum and triticales varieties to some degree. While most Australian durum and triticales have good resistance, growers need to consult a current cereal variety disease guide for individual variety resistance ratings (see Useful Resources). The fungal population differs in virulence across Australia so ratings in different regions may vary.

Wheat STB can occasionally infect oats and barley plants but they rarely develop significant levels of disease. However, both oats and barley can be infected by specialised forms of Septoria which have similar leaf symptoms to wheat STB (Septoria tritici f. avenae on oats).

Risk factors

Farm practices such as early sowing, minimum tillage, stubble retention, wheat-after-wheat crop sequences and growing susceptible wheat varieties are the main risk factors that increase the chance of infection. Weather conditions are also an important risk factor. Infection by the fungus is much greater with frequent rain events and where moist conditions extend over long periods.

Symptoms

Septoria tritici blotch in wheat causes brown-coloured lesions. In more susceptible varieties, the lesions can appear silver-grey. The lesions tend to run parallel to the leaf veins. Black fruiting bodies (pycnidia) are usually visible on the dead leaf tissue (Figure 1 and 2).

In the southern grain growing region, favourable conditions for infection rarely persist into spring so infection of the upper canopy is less common. In high rainfall zones when conditions are favourable, lesions can spread across the leaf forming large blotches (Figure 2). In wet springs, if infection appears after flowering, the glumes may become diseased.
CASE STUDY: Managing STB resistance to fungicides

Increasing resistance of STB to some azole fungicides has been detected in Australia. Research by NSW Department of Primary Industries has found that while the resistance may not be causing reduced spray efficacy at present, a strategy to prolong fungicide effectiveness is vital.

It is the first time a pathogen of wheat in Australia has been identified as developing resistance to fungicides. The two mutations identified affect the efficacy of a number of triazole fungicides (Group 3) commonly used in Australia; triadimefon triadimenol, tebuconazole, propiconazole and epoxiconazole (note that epoxiconazole is not registered for control of STB in Australia).

These mutations reduce the effectiveness of these fungicides rather than making them completely ineffective. However if they continue to be used, further selection pressure will be applied to the pathogen and potentially new mutations will be selected.

One method thought to reduce the selection rate of further mutations is to mix or alternate different azoles. This is because not all azole fungicides are affected equally by mutations of the STB fungus. Products that combine azoles such as Tilt® Xtra (propiconazole and cyproconazole) or Impact Topguard® (tebuconazole and flutriafol) which have a registration for STB could be used in this way. Growers MUST always follow label guidelines and ensure maximum residue limits are adhered to at all times.

In Australia, there are a limited choices of fungicides with different modes of action for use on wheat. A number of products combine a strobilurin with an azole and these may provide some benefits in delaying or reducing the risk of resistance development. However the strobilurins on their own are considered to be at high risk of developing resistance due to their single site mode of action. In the United Kingdom, resistance to strobilurins is so widespread in the STB population they are no longer effective, even in mixtures. Currently none of the products with an azole/strobilurin combination in Australia used on wheat are registered for use on STB.

As the plant matures, the fungus grows and feeds on decaying organic matter, which leads to infection of the stubble and survival of the fungus into the following season. The survival of STB on the stubble means that a break crop is necessary to help reduce disease carryover.

Disease cycle

The fungus Zymoseptoria tritici can survive in crop stubble and plant debris for more than one season. The length of survival depends on the rate of stubble breakdown. In autumn/winter, the fungus develops sexual fruiting bodies that appear as black, pinhead-sized structures which sit at or just below the surface of the stubble and leaf blades (Figure 2).

Primary infection is mostly initiated by sexual spores (ascospores) produced in the fruiting bodies. Ascospores become airborne and can infect young plants in early-sown crops. The airborne nature of the spores means they can infect surrounding crops and regions.

Secondary spread within the crop occurs from rain splash by asexual fungal spores, conidia, produced on infected leaves. Temperatures of 15°C to 20°C with rain followed by at least six hours of leaf wetness or dew are optimal for infection.

Strain types

Different strains (pathotypes) of Z. tritici have been found throughout the cropping zone, resulting in different variety ratings. Resistant varieties may become more susceptible over time as the pathogen adapts to the resistance genes they carry.

It is important that growers check the resistance rating of varieties in their region using a current disease guide, but also be aware that if a variety is susceptible in neighbouring regions there is a risk of that strain migrating into a new area.

Management

An integrated approach that incorporates crop rotation, variety selection, stubble management and fungicides (if required) can provide effective suppression of STB.

Crop rotation

Septoria tritici blotch survives on cereal stubble between crops, specifically where wheat on wheat is sown. After a very dry season, the fungus may survive over 18 months and infect second year crops. In most instances, a one-year rotation out of wheat is highly effective in reducing early disease occurrence.

Variety selection

Variety choice has a major influence on STB development in crops. Resistance ranges from moderately resistant (MR) to very susceptible (VS), however, growers should check their local and current variety disease guide (see Useful Resources) and ensure they make appropriate selections. Where wheat is to be sown into wheat stubble, it is best to avoid varieties that are rated susceptible (S), susceptible-very susceptible (S-VS) or very susceptible (VS).

Stubble management

Any tillage practice that reduces stubble density on the surface will reduce the level of inoculum. Surface stubbles may...
**FREQUENTLY ASKED QUESTIONS**

**How do I know if I have fungicide-resistant STB in my crop?**
Fungicide applications can be affected by dose and timing. If a fungicide is applied at the correct rate and time but disease development continues, then seek advice. Samples should be tested for possible changes in sensitivity. These can be sent for analysis to Dr Andrew Milgate, NSW DPI Plant Pathology, PMB Pine Gully Road, Wagga Wagga, 2650. Samples should be wrapped in a dry paper towel and placed into an envelope and posted with location and submitter’s contact details.

**What yield loss can STB cause?**
Yield loss will depend on the variety grown and prevailing seasonal conditions. If susceptible and very susceptible varieties are grown, this disease is likely to cause annual average losses of up to 20 per cent with individual crop losses much higher. If moderately susceptible—moderately resistant (MS-MR) varieties are grown, and the spring is not exceptionally wet, then it is unlikely there will be significant yield losses. Yield losses will be highest if growers choose to grow susceptible varieties and there are wet spring conditions.

**If a young crop has severe STB, should it be sprayed with a fungicide?**
If the time of year and weather forecasts suggest there will be frequent rain events followed by long dews in the morning then a fungicide may provide useful protection for up to three weeks. Otherwise it is likely that the crop will grow away from the disease with little benefit from a spray as the fungus will not thrive in dry conditions.

**How do I know whether my crop has STB, and not another foliar disease?**
Initial symptoms, which may appear on the seedling, will be small brown to greyish spots. As the disease progresses, look at the leaf lesions for the characteristic black fruiting bodies of the fungus. The leaf tissues around the site of the disease will appear yellow or dead.

**Discolouration of leaves, in particular flag leaves.**

Fungicide management
Most STB in south-east Australia occurs only at early seedling growth stages. If wet conditions persist, such as in high rainfall zones, and susceptible varieties have been sown then fungicides may provide some useful control.

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In high risk areas, the timing of fungicides will be important to achieve adequate disease control. In early sown susceptible varieties an early fungicide application at GS31–32 may be required to suppress the disease and protect emerging leaves. Once the flag leaf has fully emerged at GS39 another fungicide application may be required to protect the upper canopy. Azole fungicides are used in combination with variety resistance to control STB in south-east Australia. Growers need to use fungicides in a way that prolongs their effectiveness (see side case study for clarification).

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