Protecting WA Crops

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Contents

The 2025 GRDC Grains Research Updates, showcases the latest research and results from across the Western Australian (WA) grains industry.

Several Crop Protection researchers from the Department of Primary Industries and Regional Development (DPIRD) were among the industry experts presenting on a variety of topical issues.

In this issue of Protecting WA Crops, we spotlight the presentation delivered by DPIRD principal research scientist Geoff Thomas.

Flag Smut in wheat; how to respond to 2024

At a glance:

- Flag smut, caused by the fungus *Urocystis tritici*, occurs sporadically in most growing seasons in the medium and lower rainfall regions of the WA grainbelt.
- Flag smut incidence and severity were higher than usual in 2024, particularly in more susceptible varieties and crops sown without a registered fungicide as a seed dressing.
- The fungus is carried externally on seed. Spores of the fungus are carried on seed coat or survive in soil for 3-7 years.
- Foliar fungicides are ineffective and unregistered for flag smut control.
- For at least the next 3 years, wheat crops sown into paddocks affected in 2024 with flag smut should be of more resistant varieties or be sown with a registered fungicide seed dressing (particularly susceptible varieties).

Flag smut, caused by the fungus *Urocystis tritici*, occurs sporadically in most growing seasons predominantly in medium and lower rainfall regions of the WA grainbelt. It occurs across the grainbelt, being reported from Esperance to Geraldton, but has appeared most frequently in the Kwinana port zone. Current farming systems that include crop rotation, fungicide seed dressings, and resistant varieties have significantly reduced its potential impact, however in 2024 the incidence and severity of infection within paddocks was significantly higher than normal. Infection in the 2024 season may have impacted yield in some paddocks. Importantly, it will have contributed to increased concentration of soil borne inoculum and greater disease risk for coming years.

Symptoms and impact

Flag smut primarily affects the leaves of wheat plants, unlike other smut diseases that target the heads (e.g. loose smut, common bunt). The disease is characterised by long, raised black streaks on the leaves, leaf sheaths, and sometimes stems. These streaks eventually break open, releasing masses of sooty grey-black spores. Symptoms are most likely to become evident around booting to head emergence.

Infected plants often exhibit stunted growth, curled and distorted leaves, and excessive tillering. Not all tillers show symptoms, but those that do generally fail to produce grain. Flag smut can have significant impact on the yield of individual plants and crop yield loss is closely related to disease incidence. In WA, the disease is generally at trace levels in paddocks. In the 2024 season incidence of infection was greater than 5% in some paddocks and would have impacted yield.

Flag smut life cycle

Spores are released from affected leaves and stems during harvest, contaminating both grain and soil. Spores can be transferred on infected seed, contaminated machinery, infected plant material or by soil movement. Spores can survive in soil for between 3-7 years making it difficult to avoid flag smut infection once it has established in a paddock. Infection occurs when spores germinate and penetrate the coleoptile of seedlings before and during emergence. The spores can survive under a wide range of environmental conditions— they are resilient to temperature fluctuations and can withstand both dry and moist soil conditions. Following penetration, the fungus grows systemically within the plant leading to the characteristic symptoms of flag smut, including black streaks on leaves and stems, often becoming evident around booting to head emergence.

Environmental and soil conditions at time of planting are reported to impact disease risk. Warm soil temperatures (18-24°C) and drier soil conditions are reported to favour spore germination and plant infection. Deeper and earlier sowing have also been linked to increased disease risk in affected paddocks.

Disease incidence in WA

Flag smut occurs sporadically across medium and lower rainfall regions of the WA grainbelt in most seasons. Since 2020, DPIRD surveillance has reported flag smut in all seasons except 2021. It generally occurred in less than 5% of paddocks visited and less than 1% plants have been affected within the paddock. Noticeably in the 2024 season, 10% of wheat paddocks visited had flag smut present with incidence in some paddocks potentially reaching yield impacting levels (>5% incidence).

Factors contributing to high disease incidence in 2024 include, warmer than median temperatures in most regions during wheat crop germination and emergence; increased adoption of susceptible (S) to very susceptible (VS) varieties in lower rainfall

environments; reduced deployment of fungicide seed dressings in lower rainfall environments; and regular wheat on wheat plantings exposing emerging seedlings to soil borne inoculum pressure.

Resistant varieties are available

Wheat varieties grown in WA vary in disease resistance ranking from very susceptible (VS) to resistant (R) (2025 CVSG). Variety rankings were assessed by DPIRD as part of National Variety Testing (NVT) services until 2020.

In the 2024 season, >45% of crop area was sown to varieties ranked susceptible (S) or worse and only 7% area to varieties ranked resistant to moderately resistant (RMR). The most commonly grown variety (>35% crop area), Scepter, is ranked as moderately susceptible to susceptible (MSS).

At the DPIRD Merredin Dryland Research Institute, a trial investigating the influence of time-of-sowing and varieties of wheat was planted into a soil with soil borne inoculum of flag smut. The plants in the trial had severe infection which affected whole plants and large areas of some plots. Greater infection was evident in late-April sown plots compared to mid-May sown plots. Varieties rated MSS (e.g. Scepter) had approximately 20% of plants affected, while varieties rated susceptible to very susceptible (SVS) (e.g. Vixen) or VS (e.g. Rockstar) had approximately 50% of plants affected in the earliest sowing times. Some newer varieties, without current disease ratings for flag smut, such as Vortex, Calibre, Shotgun, Dozer CL Plus and Tomahawk CL Plus, had disease incidence that ranged between Scepter (MSS) to Rockstar (VS). Varieties ranked RMR (e.g. Ninja, Catapult, Kinsei) to R (e.g. Denison, Illabo) had an estimated 0-5% infection, even under extremely high disease pressure (Table 1).

Table 1. Visual estimate of Flag Smut incidence in wheat variety by time of sowing experiment at DPIRD Merredin Dryland Research Institute 2024. Average of 3 replicates from plots sown 24 April 2024.

Variety	CVSG25 ranking*	Estimated incidence Infected plants (%)
Illabo	R	0%
Ninja	MR	0%
Rottnest	-	0%
Kinsei	RMR	<1%
Denison	R*p*	<1%
Firefly	-	<1%
Genie	-	<1%
Catapult	RMR	1-5%
LRPB Mowhawk	-	1-5%
Brumby	-	5-10%
Thumper	-	10-20%
LRPB Mammoth	-	10-20%
Scepter	MSS	10-20%

Variety	CVSG25 ranking*	Estimated incidence Infected plants (%)
LRPB Vortex	-	20-30%
Calibre	-	20-30%
Dozer CL Plus	-	30-40%
Tomahawk CL Plus	-	50-60%
RockStar	VS	50-60%
Vixen	SVS	50-60%

* Resistance ranking – 2025 DPIRD Crop Variety Sowing Guide. Varieties with (-) have no ranking data available, *p* is provisional rating.

Fungicide seed dressings are an effective management strategy

Fungicide seed dressings effectively control flag smut and a range of registered products are available. These have been collated into tables and available on DPIRD's Registered foliar fungicides for broadacre crops webpage or through the Australian Pesticides and Veterinary Medicines Authority (APVMA) website.

Local and recent experimental data is limited for this disease, however, a DPIRD seed dressing fungicide trial in 2016 at Dalwallinu was sown with Corack wheat (S) into a paddock known to have soil borne flag smut inoculum present. Untreated Corack showed incidence of 0.8% plants affected by flag smut, all seed treatments (fluxapyroxad, triadimenol, fluquinconazole) were 100% effective and reduced flag smut infection to undetectable levels (0%). Foliar fungicide applications were ineffective in reducing flag smut expression and there are no in-crop control options registered.

DPIRD experimental data from 1980s shows that seed dressing fungicides containing a range of active ingredients including currently registered active ingredients triadimenol, carboxin and flutriafol provided 82-100% reduction of flag smut from incidence levels of 6.4% and 7.3% at 2 sites.

Conclusion

Flag smut of wheat is relatively easy to manage either through the use of more resistant varieties or application of registered fungicide seed dressing on more susceptible varieties. Unlike other smut diseases such as loose smut of barley, which is only seed borne, flag smut is both seed and soil borne and as such both seed source and paddock history are relevant factors in current season disease risk. Given the extended period that spores can survive in soil and the high level of disease that occurred in 2024 season, it is recommended that for at least the next 2-3 seasons any susceptible variety be protected with a registered fungicide seed dressing, particularly when being sown into paddocks that were in wheat in 2024.

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Meet Crop protection team member – Stuart Bee

Stuart is a DPIRD technical officer based in Albany, working in broadacre entomology research and surveillance.

Originally from Jerramungup, he grew up on his family's farm, with agriculture playing a central role in his upbringing. Stuart pursued his passion by earning a degree in Agribusiness Marketing from the former Muresk Agricultural College, when it was part of Curtin University.

His career began in 2004, while still studying at Muresk, with a casual role at the former Department of Agriculture, where he worked for well-known research scientist, Keith Devenish on pasture research.

After some time with the department, Stuart and his wife Leanne, set off on an overseas adventure to explore the world. Stuart and Leanne returned to Jerramungup, settling back on the family farm to raise their children, where they lived for the next 20 years.

Four years ago, the couple moved to Albany. In February this year, he began his current role with DPIRD—a job he enjoys, despite joking that it's giving him "dirty knees from crop scouting and eye strain from staring down a microscope."

Outside of work, Stuart enjoys spearfishing and camping, and still identifies as a fine woolgrower.

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