

Emerging blackleg challenges this season

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Keywords

blackleg, canola, seed treatment, stubble management.

GRDC codes

UOM1904-004RTX, UM00051, CSP00187, MGP1905-001SAX

Take home messages

- Seedling infection levels of blackleg in 2022 were not severe, as the season prior to spring was very conducive for excellent plant growth.
- Crown canker was low due to good blackleg resistant cultivars, highly effective SDHI fungicides and most crops being sown early prior to cold winter conditions.
- Crown canker was more severe where water logging occurred. This was due to root tissue death which is easily colonised by fungi.
- Upper canopy infection (UCI) was not severe as most crops flowered in a normal flowering window. The cool wet spring also meant that crops did not mature under stress and therefore plants could tolerate any partially blocked vascular tissue in their stems and branches. Fungicide application at the early bloom stage was also widely adopted and highly effective.
- Pod infection was in some circumstances very severe. Rainfall which occurred post flowering, caused both blackleg and Alternaria infection. Mature pods were colonised by saprophytic fungi.
- Disease on pods, wind, hail and delayed harvest resulted in pod shatter, which was probably the cause of most yield loss in 2022.
- Blackleg management in 2023 will not be changed as a result of wet conditions in 2022. That is, high levels of infection in 2022 will not change the disease risk in 2023.

Learnings from 2022

The 2022 season, was the perfect canola growing season in Victoria and Southern New South Wales up until October. An early break meant crops were established early in the sowing window. Early sown crops grew quickly and were well established prior to cold wet and sometimes waterlogged conditions in June.

Blackleg: crops avoided early seedling infection as they were already past the 3-leaf growth stage at the onset of winter, (blackleg is most severe between late May and mid-August). In addition, new cultivars generally have excellent blackleg resistance (blackleg ratings MR (moderately resistant) or above) and most seeds were treated with a highly effective SDHI seed treatment and/or flutriafol on the fertiliser. As a result, the proportion of seedling blackleg infection in 2022 was generally low. However, where waterlogging occurred, crown canker was much more severe, as waterlogging caused root tissue death which is easily colonised by blackleg.

Downy mildew: downy mildew is most severe when it kills the cotyledons and 1st true leaves, robbing the crop of vital seedling vigour. Crops that are set back early, are more reliant on

favourable spring growing conditions for high yield. In 2022, crops were well established prior to conditions becoming conducive for downy mildew although, downy was commonly present the infections were generally not severe and unlikely to cause yield losses.

White leaf spot: white leaf spot (WLS) is a very common disease, causing the loss of leaf photosynthetic area. In 2022, regions which possessed a cool climate and increased winter rainfall, experienced a greater level of infection leading to a reduction in leaf area. Miravis Star is registered for WLS control and was likely warranted in some southern Victorian crops.

Spring 2022 was obviously an extremely wet period and given the very high rainfall, it can be assumed that crops would be severely infected with Upper Canopy Infection (UCI) blackleg, which causes vascular tissue within the stem and leaves to become partially blocked. However, July which is the key infection month for early flowering crops was not overly wet. In addition, data from CSIRO shows that UCI is expressed when crops mature under warm dry conditions. Therefore if late spring conditions are cool and moist, plants will experience lower levels of stress, typically reducing the expression of UCI, limiting yield loss. By 2022, most growers had previous experience with UCI and therefore, many applied fungicides in response to the very favourable canola outlook at the time. The result of a cool moist spring and fungicide protection meant that UCI was not a big issue in 2022.

Pod infection during late spring is where and when the season turned pear shaped, as a lot of rain fell on crops post flowering which resulted in pod infection. Pods were infected with blackleg, *Alternaria* and other saprophytic fungi. As expected, blackleg and *Alternaria* caused significant yield loss to many crops. Yield loss occurs when the seed inside the pod becomes infected (causes seed to die and shrivel) and of premature pod shattering. This was made worse as most crops could not be windrowed and harvested at an ideal time as machinery could not get onto the waterlogged paddocks. The delayed harvest in 2022 also meant that pods matured (50% seed colour change) whilst the plants supporting the pods remained completely green. Some plants even had mature pods but were still producing new leaves!

In 2022 pods were also impacted by unusual symptoms. As previously stated, mature pods remained on unharvested plants in some circumstances for a considerable time period. With constant rainfall, these mature pods were infected with opportunistic saprophytic fungi, causing discolouration on the pods. This was made worse in crops where plants had prematurely died due to waterlogging, where many dead plants were a very grey colour as they were colonised by saprophytic fungi. When harvest did occur, high levels of mould were reported on seed. Kurt Lindbeck (NSW DPI) grew cultures from many infected seed lots, and interestingly all cultures were either Blackleg or *Alternaria*. The saprophytic fungi were only present on the pod and did not penetrate onto the seed. The other issue in 2022 was how blackleg infected the pods. Normally, Blackleg infections produce lesions along the pods however, the infection also caused the pods to turn white, starting at the peduncle and working towards the tip. Pycnidial fruiting bodies then occurred across the entire pod, rather than within a round lesion as it normally occurs. We do not know why this new symptom occurred.



- a) Disease and shattered water logged plants
- b) Waterlogged crown infection
- c) Entire pod blackleg infection
- d) Pods being colonised by various fungi as they mature

Figure 1. Images of blackleg infection (a,b &c) and (d), a range of diseases as pods mature

Management decisions for 2023

Will I get an economic return from applying a fungicide to my canola crop?

In recent times, new fungicide actives and new timing recommendations have resulted in large yield responses. Many agronomists have reported 20% returns, yet many others have also reported no yield returns. In our trials, we have achieved up to 49% return however, we have also achieved a return of 0%. So how do you know where your crop will sit in 2023?

Obviously, predicting a yield return will be very accurate if you know exactly how much disease will occur, but unfortunately, the level of crop damage caused by disease is determined by a number of interconnected factors and to complicate it further, other diseases such as Sclerotinia, white leaf spot, powdery mildew and Alternaria, can also influence economic returns.

The key is to identify the risk for an individual crop and then determine the cost of application compared to the cost of potential yield loss. In most years this is relatively easy, for example, low rainfall years are low risk, whereas with a high rainfall year and high yield potential, it is very easy to gain an economic advantage from fungicide application. But it is the decile 4 to 7 years where there is lots to be gained or lost from fungicide decisions.

Blackleg crown canker

Do I need to protect seedlings?

Canola intensity in the rotation and in the landscape continues to increase. Canola intensity is a driving factor for blackleg due to this disease being stubble borne. Therefore, understanding your risk of blackleg is essential. Risk is driven by the following factors:

- Canola growing region – high canola intensity and high rainfall = high risk. 1 in 4-year rotations and 500m isolation between this year's crop and last year's stubble reduces risk. Monitor crops for both UCI and crown canker so that you know if you need to retain or change practices.

- Distance to canola stubble – crops sown adjacent to one-year-old stubble will have the highest amount of disease, so maintain a 500m buffer if possible.
- Cultivar resistance – cultivars rated R-MR or above have very low risk of developing crown cankers. MR will develop cankers but only if grown under high disease severity, for example canola/wheat/canola in high rainfall. See www.grdc.com.au/resources-and-publications/all-publications/publications/2020/blackleg-management-guide
- Pathogen population – if you've grown the same cultivar for a number of years and disease severity is increasing, and you sow a cultivar from the same resistance group, then you will be at a higher risk of crown cankers.
- Crop germination timing – severe crown canker is most likely to develop when plants are infected during the early seedling stage (cotyledon to 4th leaf). The driving factor for seedling infection is the length of time that the plant is exposed to blackleg infection while in the seedling stage (Figure 2). Therefore, the risk of seedling infection, which leads to crown cankers, is very variable from season to season. For infection to occur, blackleg fruiting bodies on the canola stubble must be ripe and ready to release spores. Fruiting bodies typically become ripe approximately three weeks after the break of the season, when the stubble has stayed consistently moist. Spores are then released with each rainfall event. Temperature also has a large influence as it will determine the length of time that the plant remains in the vulnerable seedling stage. Once plants progress to the 4th leaf stage, they are much less vulnerable to crown canker. Older plants will still get leaf lesions, but the pathogen is less likely to cause damaging crown cankers as the fungus cannot grow fast enough to get into the crown. Typically, plants sown early in the growing season (April) will develop quickly under warmer conditions and progress rapidly past the vulnerable seedling stage, whereas plants sown later (mid-May) will progress slowly and remain in the vulnerable seedling stage for an extended period.

Blackleg upper canopy infection fungicide application

Blackleg upper canopy infection (UCI) refers to infection of the upper stem, branches and flowers and whilst we are constantly improving our understanding regarding these new symptoms, there is still a very large knowledge gap of how individual cultivars react to UCI. Furthermore, our research shows that similar symptoms of UCI can cause a very severe economic impact in one season and have no economic impact in another. As such, our recommendations for managing blackleg UCI are constantly evolving. However, we now know that early sowing, which leads to early flowering, is a major trigger for UCI (Figure 2).

What are the steps to determine a UCI spray decision?

- Leaf lesions – presence of leaf lesions indicates that blackleg is present and that your cultivar does not have effective major gene resistance. No leaf lesions = no reason to spray. However, if you have applied a seedling foliar fungicide, a lack of lesions may be due to the effects of that fungicide, and the crop may still become susceptible to UCI at the early bloom stage.
- New leaf lesions on the upper leaves as the plants are elongating – this observation is not critical but does give an indication that blackleg is active as the crop is coming into the susceptible window. However, a number of wet days during early flowering will still mean high risk, even if there were no lesions on new leaves up to that point. Remember, it will take at least 14 days after rainfall to observe the lesions. More lesions = higher blackleg severity.

- Date of 1st flower and targeted date of harvest – the earlier in the season flowering occurs, the higher the risk. This date will vary for different regions. Generally, shorter season regions can more safely commence flowering at an earlier date compared to longer season regions. An earlier harvest date results in less time for the fungus to invade the vascular tissue and cause yield loss. Consequently, if you're in a long growing season rainfall region, your crop flowers in early August and is harvested in December, you are in a very high risk situation.
- Genetic resistance – this is a knowledge gap for growers. If a crop variety is susceptible, it is much more likely to gain a yield response to a fungicide. At present no cultivars have a UCI blackleg rating. In 2022 the GRDC investment UOM1904-004RTX screened all commercial cultivars for UCI resistance. It is hoped that a UCI blackleg rating system can be developed in conjunction with seed companies.
- Yield potential – yield potential is simply an economic driver. A 1% return on a 3t/ha crop is worth more money than a 1% return on a 1t/ha crop.

How can I determine if I should have sprayed for UCI

- Check for external lesions
- Cut branches and stems to check for blackened pith, which is indicative of vascular damage and likely yield loss
- Observe darkened branches, these branches go dark after vascular damage and are indicative of yield loss
- Pod infection will cause yield loss, unfortunately there is nothing that can be done to prevent pod infection
- Leave unsprayed strips to check for yield returns.

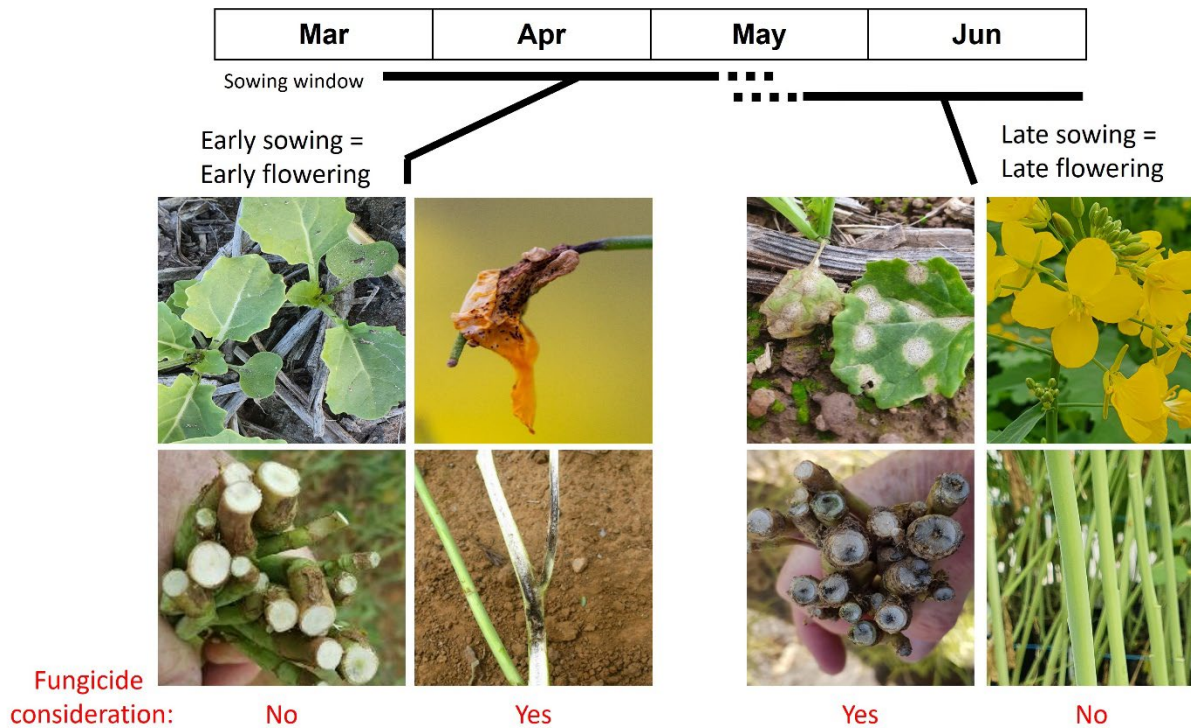


Figure 2. Sowing time, and therefore flowering time determines whether you will be needing to control crown canker blackleg or upper canopy infection blackleg.

Acknowledgements

The research undertaken as part of this project is made possible by the significant contributions of growers through both trial cooperation and the support of the GRDC, the author would like to thank them for their continued support.

Useful resources

BlacklegCM App for iPad and android tablets

Blackleg management guide (www.grdc.com.au/resources-and-publications/all-publications/publications/2020/blackleg-management-guide)

Marcroft Grains Pathology (<https://marcroftgrainspathology.com>)

Australian Fungicide Extension Network (<https://afren.com.au/>)

NVT Australia (<https://nvt.grdc.com.au/>)

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Date published

February 2023